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ALASKA AGRICULTURAL EXPERIMENT STATIONS.

C. C. GEORGESON, Agronomist in Charge.

Under the supervision of the STATES RELATIONS SERVICE,
Office of Experiment Stations, U. S. Department of Agriculture.

**REPORT OF THE ALASKA
AGRICULTURAL EXPERIMENT
STATIONS**

1917



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**ALASKA AGRICULTURAL EXPERIMENT STATIONS, SITKA, KODIAK,
RAMPART, FAIRBANKS, AND MATANUSKA.**

[Under the supervision of A. C. TRUE, Director of the States Relations Service, United States Department of Agriculture.]

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LETTER OF TRANSMITTAL.

ALASKA AGRICULTURAL EXPERIMENT STATIONS,
Sitka, Alaska, April 20, 1918.

SIR: I have the honor to submit herewith a report of the work of
the Alaska Agricultural Experiment Stations, 1917.

Very respectfully,

C. C. GEORGESON,
Agronomist in Charge.

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Publication recommended.

A. C. TRUE, *Director.*

Publication authorized.

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¹ Transferred from Kodiak Station in August, 1917, in place of J. W. Neal, resigned.

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REPORT OF THE ALASKA AGRICULTURAL EXPERIMENT STATIONS, 1917.

SUMMARY OF WORK AT THE SEVERAL STATIONS.

By C. C. GEORGESON, *Agronomist in Charge.*

WEATHER CONDITIONS.

From an agricultural standpoint, 1917 was the worst season since these investigations have been in progress, the general average of results being, therefore, also the least satisfactory. The summer of 1915 was a favorable season from the standpoint of agriculture. By comparing the daily mean temperature at four of the stations for June, July, and August of that year with the temperatures of the same period for 1917, we find the cause of the difference in results. The facts are as follows:

Daily mean temperatures for June, July, and August.

Station.	1915	1917	Difference.
	° F.	° F.	° F.
Sitka.....	57.3	52.9	4.4
Kodiak.....	56.2	51.8	4.4
Fairbanks.....	61.3	57.27	4.03
Rampart.....	61.2	¹ 59.0	2.2

¹ For June and July only.

It is evident that a lowering of more than 4° in the daily mean temperature for the growing season will be disastrous to the development of farm crops.

Not only was the temperature of the summer of 1917 low, but the rainfall was excessive, the heaviest on the coast coming in August, in the interior in July, during which month the sun scarcely appeared, although the rainfall had been too light for some time previous to July. In consequence, the grain crops in the interior were stunted from lack of moisture in the early stages, but grew too vigorously during July, when the roots sent out much new growth, a decided detriment to the production of grain. However, killing frosts held off until the middle of September, an unusual occurrence, and the grain crops at the interior stations matured.

SITKA STATION.

C. H. Benson, the assistant at Sitka Station since J. P. Anderson left the service December 31, 1916, is an expert propagator and greenhouse man. His work has been chiefly along these lines, but he has also assisted in the management of the work of the station and has at times had full charge. The data herein reported for Sitka Station as to the growth and behavior of the garden crops are to a large extent based on his notes.

The services of J. Koppelle were secured for the outdoor work during the summer of 1917. He is an expert gardener and orchardist, who received most of his training in his native country, Holland.

CHARACTER OF THE WORK.

The Sitka Station is devoted entirely to horticulture. When the station was begun several attempts were made to grow grain, raise stock, and practice general farming, but grain growing proved a failure because the heavy rainfall made it impossible to save the grain after it matured, and stock raising was impracticable because of lack of pasture and meadow land at this particular location. Stock feed could be obtained along the beach at the head of various bays and inlets, but the grass had to be cut and hauled to the station barn in scows, a procedure too expensive to be practicable, as was also the clearing of land on which to raise feed. Grain growing and stock raising were therefore abandoned and the station devoted to the various lines of horticulture which can be made a success in this region. The work now consists in testing hardy vegetables on a small scale and in introducing, testing, propagating, and distributing for trial elsewhere such varieties of fruits and berry plants as are suited to Alaska. Special attention is paid to plant breeding with a view of producing new varieties well adapted to the climatic conditions.

POTATOES.

The potato is, without question, the most important vegetable grown in Alaska. Every garden patch throughout the Territory has at least a few rows of potatoes, and near Fairbanks and in the Matanuska Valley potatoes constitute the chief money crop, having been grown recently to such an extent that they have glutted the markets, as in the fall of 1917, when potatoes were cheaper at Fairbanks than at Seattle, a fact indicating the rapid development of the country. In 1910 about 1,000 tons of potatoes was shipped into Fairbanks from Puget Sound, while in 1917 only about 28 tons was shipped to the same market. The difference of more than 900 tons was supplied by the home-grown product.

Potatoes vary greatly in yield and in quality in different localities. A variety succeeding well in one place may fail in another, and its

yield and quality will also vary with the season, even in a favorable locality. It is therefore necessary to try many sorts in order to find those best suited to each set of conditions. Last year 75 varieties aside from the seedlings originated there were grown at Sitka Station, but each in only a limited number of hills, as they were not grown for market. The early varieties are the better because they reach a fuller state of maturity. Indeed, it may be said that few potatoes mature normally in Alaska, as the tops grow and remain green until killed by frosts, instead of drying up and dying naturally as they do in the States. Though the tubers may be of good size, they rarely are fully matured. Such immature potatoes are soft, soggy, and unpalatable when cooked. The problem of overcoming these conditions, experiments have proved, can be solved, at least in part, by observing the following:

(1) Select early varieties. These are usually not the best yielders, but they mature better than late varieties and are therefore of a firmer, drier, and mealier consistency.

(2) Sprout the seed in the light before planting. Three weeks may be gained thereby, and the potato has that much longer in which to mature.

(3) Plant on elevated ground, preferably on a south slope, never in the hollows. Potato tops are often killed by frosts on low ground two or more weeks before they are killed on an adjoining hillside.

If these points are observed, excellent potatoes can always be raised in Alaska, even north of the Arctic Circle.

Potatoes intended for experiments at the interior stations are first grown for a season at Sitka. Then in the latter part of August a few hills are selected and dug, and the potatoes are forwarded by mail to Rampart and Fairbanks Stations, so as to reach these points before river navigation closes. They are then kept in frost-free root houses until planting time in spring. Seed potatoes could not be shipped during the winter because they would freeze on the way, nor with present transportation facilities could they be sent in during the spring in which they are to be planted, because they would not arrive in time. This necessitates growing a long list of varieties at Sitka Station.

Potatoes from seed balls.—Experiments are in progress to develop new varieties of potatoes better suited to Alaska conditions than those now available. Occasionally hills of potatoes bloom and mature seed balls, seed from which have been collected and planted, 335 numbers raised from seed being now on trial, 135 from seed grown at Sitka in 1915 and 200 from seed grown in 1916, some of it purchased. The latter lot, seeded last spring on a sidehill, 2 feet apart in the row with 2½ feet between the rows, and grown only during that season, all produced potatoes showing great variation in time of maturity, in

foliage, yield, quality, and shape. Although it is impossible to tell what they may amount to, several are very promising. No. 203 produced 23 pounds from three hills, an average of $7\frac{3}{4}$ pounds to the hill, and 9 of the numbers gave an average of 5 pounds or more per hill, a yield better than the average from the named varieties. This lot will be tested again in 1918, when the numbers can, perhaps, be judged with some degree of accuracy.

OTHER VEGETABLES.

Only hardy vegetables can be grown out of doors. Such kinds as tomatoes, peppers, cucumbers, and melons can not be grown in the coast region, and even beans fail in all but exceptionally favorable seasons. All of these can, however, be grown out of doors in normal seasons at both Fairbanks and Rampart, not so well, however, as in the States, though if started under glass and given much care they rarely fail to produce usable fruit.

Cabbage.—Of the varieties grown, Early Copenhagen Market, Extra Early Express, and Fordhook Mainstay Early were the best. Others not so satisfactory were Early Jersey Wakefield, Early Winningstadt, and Surehead. Not only was the season unfavorable, but the plants also suffered severely from the root maggot in spite of the fact that they were protected from this pest by shields of tar paper. Pieces of heavy tar paper are cut 3 to 4 inches square. A hole is punched in the middle and a slit made to one side. The stem of the newly set plant is put through this slit, and the soil is patted down about the square. This keeps the maggot from getting to the root. The maggots are the larvæ of a small, two-winged fly, which lays its eggs on the leaves or stem of the plant near the ground. When the eggs hatch, the maggot wriggles down the stem, and upon reaching the surface, begins to suck the juices from the plant. Of the many remedies tried, the tar paper appears to be the most effective.

In the past clubroot, a slime mold, has given some trouble, but last year only three plants suffered from this disease, which can be readily controlled. As it usually starts with the seedling plants, the best preventive is to mix dry, air-slaked lime with the soil in the boxes in which the seed is sown. If the soil in the field is infected with the disease, a liberal amount of lime should be worked into the surface before the plants are set out. Rotation should also be practiced.

Cauliflower.—Four varieties were tried, Burpee's Best Early, Algiers, Early Snowball, and Extra Early Paris. Only a few plants of each were grown, all of which headed, Algiers producing the largest heads.

Broccoli.—A few plants of Early White, Mammoth, and Purple Cape were grown. The last went to seed and produced no heads. The other two headed well.

Brussels sprouts.—Long Island Improved was the only one of the several varieties tried to set a fair crop of good sprouts. None of the others is worth mentioning.

Kale.—Of the two varieties tried, Dwarf Curled Scotch and Siberian, the former was the better, a large percentage of the Siberian going to seed in the late summer.

Kohl-rabi.—Early White Vienna, the only variety tried, produced some bulbs measuring 7 inches in diameter.

Turnips.—As the turnip reaches a usable size in a very short time, it can be grown everywhere in Alaska and is usually found in every garden patch along with potatoes, lettuce, and radishes. Purple Top Milan, Amber Globe, Burpee's Extra Early, and Petrowski were grown at Sitka, the Petrowski again proving by far the best, chiefly because of its comparative immunity from the attacks of root maggots, from which pest the other varieties suffered badly. Petrowski turnip seed sown the latter part of May was ready for use July 25, and seed sown June 18 produced a good crop of medium-sized roots of excellent quality for winter use. None of the second crop was affected by root maggots.

Radishes.—The varieties grown, Burpee's Rapid Red, Golden Glow, Early Scarlet Turnip, French Breakfast, Icicle, Giant White Stuttgart, Long White Vienna, and Hailstone, all did very well, but Burpee's Rapid Red, Icicle, and Hailstone proved best and can be recommended for Alaska planting.

Beets.—Columbia and Early Petrograd were tried. Both grew well and made an even stand, but about the beginning of August both went to seed without producing roots. Beets must be grown on rich, well-drained soil. Whenever weather or soil conditions are unfavorable, all varieties tried here have invariably gone to seed.

Carrots.—Danvers Half Long, New Amsterdam, Early Scarlet Horn, Burpee's Long Orange, Oxheart, Chantenay, and French Short Scarlet were the varieties tried. All produced roots of good size, but Danvers Half Long was best.

Onions.—White Portugal (also called Philadelphia Silverskin) and Australian Brown, seeded May 3, gave unsatisfactory crops. They produced small onions fine for use in late summer, but the largest were only $1\frac{1}{2}$ inches in diameter. Onions rarely do well in Alaska.

Peas.—This vegetable as usual did remarkably well and yielded a good crop of green peas. The following varieties were grown: Burpee's Extra Early, Thomas Laxton, Laxton's Evolution, Gradus, Pilot, Burpee's Profusion, Senator Improved, and Alderman. Burpee's Extra Early were first planted on April 30, others were planted on May 3, the last planting being made on May 18. The April 30 and May 3 plantings, though slow in germinating, yielded best,

while the last planting produced a heavy crop but was too late, as about 50 per cent of the pods failed to fill out. Alderman produced the largest pods, most of them 5 inches or over in length with from 8 to 11 peas in each, and pods 6 inches in length were frequently found. Burpee's Extra Early peas were ready to use August 5; Thomas Laxton August 13; Laxton's Evolution, Gradus, and Pilot August 16; Senator Improved and Alderman August 21. Burpee's Profusion set an enormous quantity of pods, of which only a small number had time to fill out.

Broad beans.—Johnson's Wonderful and Broad Windsor both grew well and produced numerous pods, which, however, failed to attain sufficient size for table use. In favorable seasons broad beans do well and even mature seed.

Snap beans.—Extra Early Refugee was the only variety grown. It was planted in different situations but failed in all. In favorable seasons snap beans can be grown to usable size at Sitka, and at the interior stations where the summers are warmer they never fail.

Asparagus.—Though tried repeatedly, this vegetable has never been a success, as neither purchased plants nor those raised from seed have ever made satisfactory growth. Four-year-old plants produce shoots scarcely as large as pencils.

Rhubarb.—As usual rhubarb did splendidly. It is at home in the Alaska climate. The rhubarb grown by Mr. H. D. Clark, of Skagway, on the sandy soil of his farm has become famous from Dawson to Seattle. By cutting down the seed stalks as soon as they appear and by digging in plenty of stable manure about the plants in early spring, rhubarb stems of splendid quality and size can be produced. Moreover, it can be kept for winter use with very little trouble. Stems cut into short lengths and packed in glass jars filled with clean cold water and with the lid screwed down will keep for many months without deterioration.

Lettuce.—Grand Rapids, Denver Market, Iceberg, and Morse all did well. The best lettuce is produced by raising plants under glass and setting them in the open in the early part of June.

Celery.—Seed of the varieties Fordhook Emperor, Golden Self-Blanching, White Plume, and Dwarf Golden Heart was planted April 4 in the propagating house, the little plants being transplanted to flats May 29, in order to develop a good root system. They were transferred to the open June 16. Fordhook Emperor made a very vigorous growth but was soft and of poor quality. White Plume and Golden Self-Blanching were of excellent quality.

For good celery the soil must be deep, well drained, thoroughly worked, and well fertilized. The old system of trench planting is of little value anywhere in Alaska. There are two approved methods of culture. One is to plant on level ground and hill up the plants as

the stems grow. Still a better plan is to prepare a bed of any desired size, as 5 feet wide by 30 feet long (or long enough to produce the quantity wanted), consisting of rich soil 1 foot to $1\frac{1}{2}$ feet deep, about one-fifth to one-fourth of which should be thoroughly decayed stable manure well worked in. The plants should be set 6 inches apart each way for the small varieties and 8 inches apart for the larger sorts. Boards should inclose the bed. As the plants grow, soil or sand should be filled in around them. Boards 2 feet high inclosing the beds can thus be filled up. The plants will reach a marketable size by the middle of August or the first of September in southeastern Alaska, and by the beginning of August in the interior, where the growth is more rapid. Self-blanching varieties do not need to be mulched with material put between the plants. This practice is followed nearly everywhere in Alaska where celery is grown for market.

Cress.—Cress should be sown very thick and cut when it is 3 to 4 inches high. It grows rapidly and should be sown several times in the course of the summer if a continuous supply is desired. A small bed sown May 3 was ready for use by the beginning of July.

Parsley.—Several varieties are planted here, Moss Curled being a favorite. Commercial seed often fails to germinate well. The plants should be sown in rows and they can stand rather thick sowing. For winter use they can be grown under glass or in boxes in the house. A method sometimes employed is to bore inch holes 4 to 6 inches apart all over a barrel, put the parsley roots through these holes, and fill the barrel with soil, layer upon layer. If the barrel is put in a light, warm, or at least frost-free place, green parsley may be had all winter.

Herbs.—Sage, lavender, hoarhound, thyme, and rosemary all winterkilled. They can not be satisfactorily wintered without protection.

THE ORCHARD.

The orchard consists of a number of varieties of early apples and a few varieties of sour cherries. The sweet cherries tried have never matured fruit, although they bloom freely. None of the apples matured any fruit this year because of the unfavorable season. The Yellow Transparent, Livland (Lowland) Raspberry, Hyslop, and Keswick (Keswick's Codlin) bloomed quite profusely and set some apples, but on account of the cool summer none of these matured. A number of trees were transplanted in early spring in order to give them more room. The work was done so carefully and the roots were so little disturbed that the growth went on as though nothing had happened. In 1915, a favorable season, a number of apples of several varieties matured, the Yellow Transparent and the Livland Raspberry being the leaders. There are at Sitka a few trees of Duchess of Oldenburg, an early summer variety which is much es-

teemed in Wisconsin and Minnesota but which has never justified the care given it here, as it always blooms but never sets fruit.

So far no variety of apple has been discovered that can be said to be at home in this climate. The little native crab seems to be the only one suited to the conditions, and it is small and inferior, although it makes excellent jelly. Reciprocal crosses between the cultivated varieties and the wild crab have been attempted for several years, but with comparatively little success. However, a number of seedlings supposed to be hybrids have been secured which have been grafted into older trees to hasten the fruit bearing. So far none has bloomed. A variety named White Mustiala, scions of which were received from Finland with several others some years ago, was the only one of the lot not dried out too far to grow. Several small trees have grown from these scions, which, it is hoped, will in time bear fruit, as varieties indigenous to Finland ought to do well in southeastern Alaska.

Two trees of each of the following varieties were added to the list of cherries: Spanish (Yellow Spanish), Baldwin, Wood (Governor Wood), and Napoleon. They made a fair growth during the season.

The old propagating house is now devoted to an attempt at growing fruit partly under glass. One tree of each of two varieties of pear, two of peach, two of apricot, and two of plum is growing, but none has shown any blossoms.

SMALL FRUITS.

Gooseberries.—Owing to two extremely wet seasons in succession, a large number of the gooseberry bushes have dropped their foliage early in the season and have not set fruit, this being true especially of those which grew on wet, marshy ground. In other situations, the varieties Triumph, Whitesmith, Columbus, Industry, Downing, and Portage produced a fair amount of fruit. A new variety known as Dr. Van Fleet was added to the collection the past spring. As gooseberries are quite hardy, they can be grown successfully in nearly all sections of Alaska.

Currants.—The currants bloomed profusely, but owing to the rain they set fruit very sparingly. They made, however, a fair growth. The black currants appear to do better than the red.

Raspberries.—In spite of the weather conditions, all varieties bore a little fruit the past season, Cuthbert being by far the best. Loudon is also a fairly good variety which produces berries of uniform size and high quality. Miller's Favorite set many berries, of small size, however. Golden Queen and St. Regis made a medium growth but produced no fruit.

Blackberries.—This fruit has so far been a failure. Several varieties have been tried, but they have never matured fruit, although

some of them bloomed and set fruit. La Grange and Blowers were received last spring for further trial.

Blueberries and cranberries.—As mentioned in former reports, these are making very slow growth and have shown no sign of bloom or fruit this year.

Hybrid strawberries.—The strawberry work was continued as in former years. Seedlings resulting from breeding work in 1916 were planted in the field in early spring, and numbers were applied to seedlings set in the open in 1916, in all 1,333 plants. The season was so unfavorable that it was not thought advisable to pass judgment on the fruit produced for the first time by the seedling plants, and therefore no plants were discarded. They will all be tried another year, when it is hoped that better conditions will show their true value. The older plants matured fruits some three to four weeks later than in 1915 and two weeks later than in 1916. The plants never dried off, and many berries rotted before they were ripe. Crosses were made with the new varieties John H. Cook, Early Jersey Giant, and Brandywine, a few plants of each of which were obtained for that purpose.

DISTRIBUTION OF NURSERY STOCK.

The work of propagating, growing, and distributing nursery stock for trial in other sections of the Territory has been continued and increased. Requests for young trees and bushes are growing in number year by year. The stock available for distribution in the spring of 1918 includes 668 apple trees, 2,475 raspberries, 4,188 red currants, 745 white currants, 1,400 black currants, 1,327 gooseberries, 600 rhubarb plants, 269 Tartarian honeysuckle, 600 Japanese honeysuckle, 115 spirea, 30 *Potentilla fruticosa*, 45 red flowering currants, 50 Siberian dogwood, 60 Rugosa roses, 67 sweetbriers, 372 willows, and a few perennial flowers.

Plants are sent out only on request, and the recipients are asked to report on the behavior of the plants. In the spring of 1917 nursery stock was sent to 312 addresses.

Unfortunately mail delivery is infrequent, and there are often long delays at transfer points, with the result that the plants are often dried out and dead by the time they reach their destination, particularly points in the interior, where package mail is not carried until river navigation opens. This is very discouraging, both to the station and to the people who desire to try the plants. The opening of the Government railway, it is hoped, will make it possible to send live plants through to interior points in a reasonable time.

Another drawback to plant distribution is the fact that package mail sent out under frank is now limited to 4 pounds. With the wet moss and wrapping necessary to preserve the plants, only a very

few trees and shrubs can be put up in one package. Tests can therefore not be made with the number of plants desired.

ORNAMENTALS.

Alaska stands in need of hardy ornamentals. As there are few indigenous shrubs or plants having any value for this purpose, an effort is being made to introduce and propagate as many hardy shrubs and perennials as give promise of success.

Hardy shrubs.—The plants listed below have all been tried here for two or more years, and the comments offered on each constitute a summary of the station experience with them.

Azalea: *A. amoena*, *A. yodogawa*, and Beni Geri, received and planted out in the spring of 1917, made a fair growth and bloomed profusely. They have been protected for winter.

Berberis: *B. thunbergii* and *B. vulgaris* have been on trial three years, showing no promise. Other varieties received in the spring of 1916 and of 1917 have not yet been given sufficient trial to report on their behavior, but some are promising.

Caragana arborescens (Siberian pea tree): This plant made a good growth but did not bloom.

Cotoneaster: The variety Lowell has been on trial several years. It is very satisfactory, blooming well and setting an abundance of berries. The foliage is highly colored in autumn. Other varieties which were received in the spring of 1917 made a fair growth. These will be discussed in later reports.

Cornus sibirica (Siberian dogwood): This shrub makes a good growth, blooms well, and is quite desirable.

Deutzia: The variety Pride of Rochester froze to the ground last winter, but some growth appeared from the roots late in the season.

Diervilla (Weigelia): *Eva Rathke*, *D. rosea*, and Abel Carrière froze back quite severely, but they made a fair growth and bloomed well late in the season.

Euonymus: Two varieties received in the spring made a fair growth.

Forsythia (golden bell): This plant also froze back severely and did not bloom.

Hydrangea paniculata: This is not a satisfactory plant, as it comes into bloom too late in the season. The trouble is probably due to poor location, and the plant will be transplanted in the spring to a more desirable spot.

Ligustrum (privet): *L. vulgare* is doing fairly well; *L. ovalifolium* winterkilled this past winter.

Lonicera (honeysuckle): *L. japonica* is doing nicely, proving a good plant for covering trellises or porches. *L. tatarica* as usual bloomed profusely and made a strong growth. It is perfectly hardy

and one of the best shrubs for Alaska. This was the second year of trial for *L. thibetica*, which bore a profusion of pink blossoms and showed splendid vigor and perfect hardiness. Other varieties have so far shown little promise.

Syringa vulgaris (lilac) : So far as hardiness is concerned this plant stands the test perfectly. It does not, however, make satisfactory growth nor blossom as well as it should.

Potentilla fruticosa (cinquefoil) : These withstood the winter perfectly and bloomed well throughout the season, proving a very desirable shrub for Alaska.

Maple (shrub or dwarf) : *Acer ginnala* and *A. tataricum* have been growing at this station several seasons. They are perfectly hardy and desirable on account of their autumn colored foliage.

Sambucus (golden elder) : Also valued for its bright golden foliage. It made a fair growth this season and is perfectly hardy.

Philadelphus (mock orange) : Two varieties are being tried. Both have come through the winter in good shape, but have shown no sign of blooming.

Ribes sanguineum (red flowering currant) : These froze back quite severely last winter for the first time in several years, but they made very satisfactory growth throughout the season.

Rhododendron : A pinkish-lavender variety has been growing at this station several years, making a very satisfactory growth each year and bringing out a large number of perfect blossoms. It is hardy and requires no winter protection.

Spiræa (meadow sweet) : *S. salicifolia* and *S. vanhouttei* are equally hardy, the former blooming more freely, and both very desirable shrubs. *S. thunbergii* and the variety Anthony Waterer are not showing any particular merit.

Viburnum opulus (high bush cranberry) : This plant is showing perfect hardiness and making a good growth, but it does not bloom every year, not having bloomed this year. The foliage is rather ornamental. *V. tomentosum* is also a hardy species, but of little value, as buds set in the fall are destroyed through the winter.

Shade trees.—The following have lived through two very severe winters and are making good growth : English elm, Scotch elm, Norway maple, Sycamore maple, Bolle's Silver poplar, and other varieties of poplar. A number of varieties have been received during the past two years, but it is too early to report on any of these.

Herbaceous perennials.—The hardy species of this class of plants are admirably adapted to Alaska, where they can be used in the home garden to very good advantage. There are, of course, many varieties that will not thrive and bloom in this climate, but enough have proved satisfactory to give great variation in color and form of blossom from early spring until late autumn.

In order to have plants large enough to winter outside, the seed should be planted in June, preferably in shallow boxes which can be easily shifted; if a frame covered with sash is at hand this may be used. In any case, good drainage must be provided. The soil used must be light, fine, and free from weeds, and should be thoroughly soaked a day previous to planting the seed, the water being drained away so that the soil will not be sticky. The surface of box or bed should be level; pressing slightly with a board will secure this. The seed may be planted in rows or sown broadcast, the latter method being more practicable because seed is likely to be buried too deep when planted in a groove. The seed should be barely covered with fine soil and pressed down firmly with a board. No water should be applied, unless it is absolutely necessary, until the seed has germinated. Rapid evaporation of moisture can be prevented by covering the boxes with three to four thicknesses of newspaper, which can be taken off each day, soaked in water, and put back, but which should be promptly removed when the plants begin to appear. The plants should be divided while they are dormant, except those of English daisy, forget-me-not, and *Arabis alpina*. The clumps should be carefully cut up, leaving a crown for each division.

In the location selected for perennials, perfect drainage is most necessary. If possible, the ground should be enriched with stable manure, but in the absence of this, decayed vegetation or seaweed will help to make the soil porous when dug under. Bone meal and fish guano are good fertilizers and should be spaded in early in spring. Sour soil should be spaded at least a foot deep and given an application of lime, which should be well mixed with the soil.

The best time to transplant perennials is in the spring, as those set out in the fall are more likely to winterkill. They should be planted in beds, not in rows but preferably in masses, clumps, or irregular patches around the edge of the lawn, along the fences, or as a background, so as to give the whole setting a natural appearance. In planting, care should be taken to place the tall species in the background with the shorter ones in front. The smaller varieties can also be used as borders along rocks or as edging to beds. The plants should not be set too close—in fact, large strong plants like Shasta daisy, anthemis, Oriental poppy, and others, may be spaced 2 or 3 feet apart. Colors should be so combined as to make the whole effect harmonious.

The following varieties are the pick of the perennials so far tried, being hardy and dependable for the coast region. As no opportunity has yet been found to try them in the interior, they can not be recommended for that region.

Achillea ptarmica (sneezewort): A rather showy plant, bearing a profusion of pure, white flowers through July, August, and Septem-

ber. It grows to a height of from 18 inches to 2 feet, can easily be raised from seed, and can also be propagated by division of the roots.

Achillea millefolium (yarrow): Though this species belongs to the same genus as the one above, the resemblance is slight, as this is a dwarf, compact plant with fine-cut foliage and flowers carried on wiry stems 18 inches to 2 feet tall and forming large flat clusters of cerise and pink. It blooms during August and September, and is propagated by division of roots.

Aconitum (monkshood): A tall, rather attractive plant useful for background and easily raised from seed. The variety tried is a pale yellow, but others may be had in various shades of blue.

Alyssum saxatile compactum (gold dust): A very showy dwarf plant producing in June and July masses of yellow flowers somewhat like the large sweet alyssum. It is easily raised from seed, but should be protected in winter.

Anthemis: Too much can not be said in favor of this plant. It withstands rain and produces continuously from the middle of July to late in autumn clear, single, daisy-like flowers in great profusion, single plants attaining 2 to 3 feet in diameter and in height. Its beauty is a feature well worth considering. The seed should be planted in May or June to have blooming plants the following season.

Aquilegia (columbine): A splendid perennial for Alaska, blooming in May and June in various colors. The singles are the more desirable, as the flowers are larger and more graceful. It is raised from seed, which should be planted early in May in order to have blooms the following spring. Many beautiful varieties are offered by seedsmen.

Arabis alpina (rock cress): One of the earliest flowers in spring; dwarf and creeping in habit. It is completely covered with pure white blossoms and is valuable for rockwork or edging. It is easily raised from seed. The old plants should be divided each year when blooming.

Campanula medium (Canterbury bell): This is a biennial usually blooming only once. Seedlings raised in May or June will bloom the following summer. Cutting the stem of the flower as soon as the plant is through blooming will very often cause it to start new growth, and if so, it will bloom again the following year.

Campanula carpatica (Carpathian bell): A neat, dwarf, compact plant, producing white and blue blooms all summer. It is raised from seed.

Campanula persicifolia (blue bell): Another variety which has proved good, producing through July and August large, cup-shaped flowers in blue and white. It grows to a height of 1½ to 2

feet and is raised from seed. The three species of *Campanula* given above are the only ones out of 12 tried that proved of value.

Bellis (English daisy) : This is a familiar little plant blooming as soon as the snow is gone in the spring and continuing throughout the greater part of the summer. It is raised from seed. The old plants should be divided in late summer or in the fall, as this will cause them to continue to produce large and double blossoms.

Chrysanthemum (Shasta daisy) : This plant is perfectly at home in Alaska and is one of the showiest and best of the perennials. Single blossoms are often found measuring 5 inches in diameter, and 50 or more have been counted on a single plant. The Shasta daisy blooms through the latter part of July, August, and September. It can be raised from seed, allowing two years to raise a good plant. The old plants should be divided in early spring in order to secure a vigorous growth and large blossoms.

Delphinium (larkspur) : So far as this plant has been tried, it has proved satisfactory and well worth a place in the garden. Two plants set out in 1916 wintered perfectly and bloomed this season in August and September. The larkspur grows to a height of 3 feet and has long panicles of deep blue flowers. It can be raised from seed without difficulty.

Dielytra (bleeding heart) : An old-fashioned flower with fernlike foliage, ornamental in itself. It blooms the latter part of June and July, and is propagated by division only.

Dianthus (pink) : These are highly valued for their spicy fragrance and are also very attractive in appearance, blooming profusely through August. The plant is easily raised from seed. It should be protected a little in winter.

Dianthus barbatus (sweet william) : A familiar plant of splendid merit. The newer clear shades are very attractive. It is easily raised from seed.

Digitalis (foxglove) : This flower should have a place in every garden. It grows without much care, producing flower spikes 5 to 6 feet in height through August and September. It is easily raised from seed.

Dodecatheon meadia (shooting star or American cowslip) : This plant is found growing wild in swampy places in southeastern Alaska. When dug up and planted in the garden, preferably in partly shaded places, it makes an excellent plant, being dwarf, compact, and showy, with flowers of a reddish-purple color blooming in June and July.

Geranium sanguineum (cranebill) : A rather attractive dwarf plant with fine-cut foliage and crimson or white flowers blooming almost continuously from early summer to late autumn and being valuable for rockwork or edging. It can be propagated by division and can also be raised from seed.

Hemerocallis (yellow day lily): This perennial can be depended upon regardless of weather conditions. It is propagated by division only. The flowers are in clusters of clear yellow carried on strong fleshy stems and blooming in July and August.

Iris sibirica (Siberian iris): These are well adapted to the Alaska climate. The numerous and attractive flowers are much on the style of the Japanese iris, but are smaller. The plant blooms in July and is propagated by division only.

Linum perenne (blue flax): A very showy little plant easily raised from seed. The light blue blossoms are produced in profusion through July and August.

Lupinus polyphyllus (lupine): This plant is very much at home here, producing throughout the season flower spikes 3 to 4 feet long covered with dark blue, pea-shaped flowers. It can be easily raised from seed.

Lychnis chalcedonica (Jerusalem cross): A tall, rather showy perennial, growing to a height of 4 to 5 feet and producing large clusters of bright scarlet flowers through August and September. It may be raised from seed.

Lychnis haageana: Another very attractive plant of medium height, with a great profusion of blossoms larger than those of *L. chalcedonica*, the colors varying from salmon pink to dark red. It is also raised from seed.

Myosotis (forget-me-not): The Territorial flower of Alaska and a plant known to everyone. It is easily raised from seed. The old plants should be divided when they are through blooming to give them vigor and larger blossoms.

Pansy: Another familiar flower, which should be treated as an annual, that is, new plants should be started each year by planting seed in June or July so that the plants will be of good size before winter. A covering of brush will afford the necessary winter protection. Plants started early in the spring and set out when the danger of frost is over will blossom all summer.

Papaver orientale (oriental poppy): This popular, large, scarlet poppy, which is well adapted to the Alaska climate, blooms through the latter part of June and July, each plant producing a number of large, brilliant flowers. It is easily raised from seed, allowing two years to raise a good-sized plant.

Papaver nudicaule (Iceland poppy): Another poppy of splendid merit, which is also easily raised from seed. It is dwarf and compact with fine-cut foliage, producing an abundance of yellow and orange blossoms from early June to late August.

Phlox: The large number of phloxes tried, with the exception of *P. suffruticosa*, Miss Lingard, and a pink variety (name unknown), came in bloom too late in the season to be of any value. Miss Lin-

gard starts to bloom in early August, bearing large clusters of white flowers with pink eyes. These are being propagated in quantity, and a few will be available for distribution in the near future.

Pyrethrum roseum hybridum (painted daisy): This flower is very bright and attractive, producing single and semidouble blossoms in various shades through June and July. It is easily raised from seed.

Spiraea venusta (meadow sweet): This is a tall plant with highly ornamental foliage and large panicles of rose-pink, sweet-scented flowers blooming in August and September. It is propagated by division only.

Spiraea davidii: This species resembles *S. venusta* in growth and habit. The long, spiral-shaped panicles are cerise pink in color.

Spiraea filipendula: This is a dwarf plant with fernlike foliage of deep green, producing spikes of creamy white flowers through August and September.

A number of other varieties both new and old are being tried, which will be reported on later.

The following varieties have either winterkilled or proved unsatisfactory; some of them, however, will be given further trial: *Agrostemma coronaria* (mullein pink), *Amaryllis hallii*, *Anemone japonica* (Prince Henry), *Armeria formosa*, perennial aster (Michaelmas daisy), *Campanula alliariaefolia*, *C. grandis*, *C. macrantha*, *C. pyramidalis*, *C. turbinata*, *C. turbinata alba*, carnation (double hardy pink), *Coreopsis lanceolata*, *Gaillardia grandiflora*, helianthus, *Heuchera sanguinea* (alum root), *Iberis gibraltarica* (hardy candytuft), *Lathyrus latifolius* (perennial pea), pentstemon, *Primula vulgaris* (English primrose), *P. veris*, peonies, *Phlox decussata* (24 varieties), *P. subulata* (moss pink), *Rudbeckia newmanii* (black-eyed susan), *Salvia grandiflora*, *Scabiosa caucasica*, *Stokesia cyanea* (cornflower aster), *Tritonia* (red-hot poker), wallflower, *Valeriana rubra*, and verbenas.

Annuals.—Of all annuals tried this season the following gave the most satisfactory results: Alyssum (Little Gem), Antirrhinum (snapdragon), aster (varieties Comet, Pink Beauty, Dreer's Single, Fireball), Calendula, candytuft, *Centaurea cyanus* (cornflower), *Chrysanthemum coronarium*, cosmos (Early), Dimorpotheca, *Eschscholtzia californica* (California poppy), Matricaria (feverfew), Godetia (Rosamond), Lobelia (Crystal Palace), marigold (Eldorado and Legion of Honor), mignonette (Machet), nasturtium, *Nicotiana glauca* (hybrids), pyrethrum (golden feather), Schizanthus (butterfly flower), stocks (ten-weeks'), sweet peas (winter orchid-flowering), *Viola cornuta* (summer flowering pansy), and *Phlox drummondii*.

The annuals which proved unsatisfactory were Ageratum, *Ambrosia mexicana*, *Arctotis grandis*, Scarlet Runner bean, *Brachycome iberidifolia* (Swan River daisy), Calliopsis, Celosia (coxcomb), *Cen-*

taurea imperialis, *Cobæa scandens*, larkspur, *Ricinus* (castor-oil bean), verbena, and zinnia.

Such plants as asters, snapdragons, calendulas, marigolds, godetias, cosmos, etc., should be started early in hotbeds, cold frames, or light windows, so as to have plants of good size to set out when planting can be done in the open ground. Seed can be planted in shallow boxes or pots, according to the rules previously given for starting perennials from seed.

Annuals of rapid growth and early maturity, such as sweet alysum, candytuft, poppies, nasturtiums, mignonette, etc., will do best if the seed is planted in a permanent bed. When the plants come up too thick they should be thinned out while small, so as to allow each remaining plant sufficient room to develop properly.

Roses.—Thirty-five varieties were obtained this spring and planted out of doors in a bed prepared for the purpose. The majority of these made a good showing throughout the summer. All are being left in the bed to winter under different methods of protection. Results of this trial will be reported later.

Rugosa roses made as good a showing this year as in former seasons. The large double Rugosa hybrid formerly mentioned, the name of which is unknown, continues its strong growth and is producing large, double, very fragrant blossoms. Agnes Emily Carman and Madame Georges Bruant, previously reported, did not survive the winter.

ADDITION TO BUILDINGS.

The crowded condition of the one room used as a library in the headquarters building made it necessary to build an addition of one room $17\frac{1}{2}$ by $13\frac{1}{2}$ feet, which has not yet been fully fitted with shelving.

As the four-room cottage could not accommodate both a family and a single man, two small rooms and a bath were added, but bathroom fixtures have not yet been installed.

RAMPART STATION.

The work at Rampart Station is devoted chiefly to the breeding of grain and legumes. Situated in latitude $65^{\circ} 30' N.$, it is farther north than any other agricultural experiment station known to the writer, and its location has determined the line of work (Pl. I, fig. 1). It was expected, and results are beginning to prove, that varieties of grains developed at this station would be earlier than those obtained farther south. Hybrids of both barley and oats have been produced which mature earlier than their parents. The grain-breeding work, begun seven years ago, has been continued and extended year by year, and now a large number of varieties, the result of cross-breeding,

are on hand, some of them apparently stable, but the majority unstable. It is therefore too early to say much about them. The work takes time, and these first results only indicate what it may be possible to accomplish.

G. W. Gasser, in his report herewith submitted, has described the season's work in detail. The following summary merely points out what has already been done and outlines what may still be accomplished.

BARLEY BREEDING.

The chief qualities sought in the barley breeding are earliness and beardlessness. Hybrid, 19b, secured from crossing hybrid 1a and S. P. I. No. 12709, is almost an ideal barley, growing to a height of 4 feet and having stiff, strong straw, hull-less grain, and long, upright heads from which the beards have disappeared, being replaced by large hoods. The larger heads of 19b have 70 to 78 kernels and the grain matures in 106 days, some days later than the earliest hybrids, but any grain maturing by August 29 in a season like that of 1917 is a valuable acquisition. Further selections will be made from this series, but it is not expected that much improvement can be made.

Seven other types of hybrid 1a, the female parent of 19b, have been secured which are improvements on the parent types and which are apparently stable, but since they are not so promising as 19b they will be retained only for purposes of comparison.

Other promising series are 14a and 14b, 28e and 28a, and 44c. Hybrids 14a and 14b were obtained from the same cross, S. P. I. No. 19851×Abyssinian (G. I. No. 362), in view of which fact their wide variation is remarkable. The types of 14a vary in color from white and yellow to black, with several shades of purple, and all are hull-less; but few of them have any special merit except 2-2-1-2, a 2-rowed, hull-less, beardless sort with stiff straw reaching a height of 5 feet and bearing heads $4\frac{1}{2}$ inches long with 32 large kernels. This type promises to be worth perpetuating. The most desirable types of 14b are 6-rowed, hull-less, and white; but all are bearded, some of them having the remarkable quality of producing deciduous beards.

Hybrids 28e and 28a were also obtained from crossing the same parents, hybrid 14e and Hansen (G. I. No. 279). The types from 28e are all 6-rowed and black, and many of those with large grains are bearded. However, selection will be continued, as most of the types are promising. The 28a types resemble those of 28e, but they are not so good. Many of them are very early, but the straw is weak and short.

Hybrid 44c, the result of crossing hybrid 20b and Pamir (S. P. I. No. 18922), has the merit of having smaller hoods than some of the other crosses. It is a rather valuable medium early barley with very large kernels.

Taking the barley crosses as a whole, it is to be noted that there are only a very few that will be perpetuated, but these few are so superior to any of the standard varieties grown here that they will pay richly for the trouble involved in their production. Crossing will be continued with a large number of both standard and hybrid varieties, chiefly for the purpose of comparison, and all inferior types will eventually be replaced by the newer and better productions.

WHEAT.

In some of the former reports it has been stated that interior Alaska would probably never become a wheat country, but from the results obtained in recent years, this statement will have to be modified, the prospects being now that wheat can be grown successfully. It is merely a matter of finding sufficiently early maturing varieties, and these seems to have been found in recent introductions from Siberia.

Siberian spring wheats.—Through the courtesy of Director V. Pissareff, a number of varieties of spring wheat grown at the experiment station at Irkutsk have been established at Rampart. Certain more or less undesirable characteristics are common to all of them. The straw is very short, the heads small and bearded, and the kernels small and very hard, those of all but two or three varieties having a dark-red color. They all, however, have the indispensable quality of earliness, having matured every year at the experiment stations at Fairbanks and Rampart. Last year (1917), they came nearest to failing, but even then they matured, although it was late when they did mature and they probably would not have done so except for the unusually prolonged period before killing frosts set in (September 15). Some of the varieties are recent acquisitions and have not been fully tested; others have been grown for five years. The two best are Chogot and H. G. (the names or symbols under which they were received). Chogot has been the earliest variety at Rampart, H. G. the earliest and best tried at Fairbanks. They are very similar except that Chogot is slightly smaller with both glumes and kernels a darker red than those of H. G. Even if nothing better than these two is ever developed, Alaska would still be assured spring wheat that can be counted on to mature in high northern latitudes and to produce yields that will compare favorably with yields of certain varieties in the States.

Hybrid spring wheats.—The Siberian wheats are chiefly valuable for crossing with the larger and later standard varieties. Several crosses have been made, but as none of them has as yet become stable, it is too early to say much about them. Among the most promising are series 30a and 32a (Pl. IV, fig. 1). Series 30a is a cross between Chogot as the female parent and Marquis, a well-known standard

spring wheat grown somewhat extensively in the North and particularly in Canada, as the male parent. Marquis is a white-glumed wheat, smooth except for a few short beards at the tip, and too late in maturing to be depended on in interior Alaska, although it has matured both at Rampart and Fairbanks. Last year it failed to ripen at Rampart but matured at Fairbanks. The hybrids of series 30a from this cross were ripe September 10, five days before the first killing frost, this being earlier than the male parent. The heads are scarcely dense enough to indicate heavy yields, but on the other hand many of the spikelets contain five or six kernels instead of the normal three or four. It is also to be noticed that the kernels are not of uniform size, the two kernels in the tip of the spikelet being smaller than those at the base. The various selections of this series differ from each other in shades of color, in length of head, in stiffness of straw, and in the presence or absence of beards.

The cross 32a also has Chogot for the mother parent, but for the male parent Romanow, a variety of Russian origin obtained from the department some 18 years ago and, until the Siberian varieties were obtained, the earliest wheat in Alaska. It has matured nearly every year at both Rampart and Fairbanks but is too late to be counted on with safety. This variety matured also at Sitka Station in 1900. It is a bearded wheat with brown glumes and light-red kernels of medium hardness. The cross resulting from this union resembles Romanow, the male parent, in being bearded and in having brown glumes and heads of about the same length, but is apparently somewhat earlier in maturing. The spikelets at the base of the rachis carry 5 or 6 kernels each, while those toward the top have 4. Romanow has 2 kernels on the spikelet at the base and 3 on the spikelet at the top. There is a possibility, therefore, that this cross may be a somewhat better yielder than either parent, although it may not prove to be quite so early as the mother parent. As these crosses have not become stable, further changes may be looked for in succeeding generations.

Winter wheat.—So far no variety of winter wheat hardy in interior Alaska has been found, and it is doubtful whether an entirely satisfactory variety will ever be found. The Russian winter wheat, introduced by the department and known as Kharkov, has been grown at the station for many years. Every year a small percentage of plants would survive the winter and it was hoped that since they survived, they might transmit a greater degree of hardiness than was found in the average of the plants, but this hope has always been disappointed. When these surviving heads were seeded the resulting plants would freeze down, and the following spring only a small percentage would be alive. Last year nothing survived of this variety.



FIG. 1.—GENERAL VIEW OF RAMPART STATION, 1917.



FIG. 2.—HYBRID STRAWBERRIES (SITKA HYBRID NO. 320) HARDY AT RAMPART.



FIG. 1.—VICIA CRACCA IN BLOOM, RAMPART STATION.



FIG. 2.—ALASKA PEAS, RAMPART STATION; YIELD, 1,675 POUNDS THRASHED PEAS PER ACRE.

Alaska will therefore probably have to depend on spring wheat for its wheat supply.

RYE.

Winter rye.—A dozen varieties of winter rye grown at Rampart are hardy enough to survive the severest winters provided the field is covered with a layer of snow some 2 or 3 feet deep, but on exposed places where the snow blows off, it is either entirely killed or the plants are so reduced in vigor that the yield is negligible. Winter rye will probably never be a popular crop with Alaska farmers, as it takes 13 months to mature a crop. The seed must be sown in the latter part of July or the 1st of August to get the crop established before the freeze-up, and it can usually not be harvested until the latter part of August or beginning of September of the following year. The only hope of bringing about increased production of winter rye lies in the possibility of developing a variety that shall mature early enough to be harvested in July. The seed from the current season can then be sown at once for the next year's crop. Some crosses have been made between different varieties of winter rye, some of them quite desirable, but as yet there is no improvement to report.

Spring rye.—For some years past we have grown several varieties of spring rye, but they are later in maturing than spring wheat, nor do they give promise of being better yielders than wheat when they do mature. The only hope of popularizing this crop is to introduce a variety from some foreign source or to produce one by hybridization that shall be earlier than any that have so far been tried. With this end in view the work will be continued.

OATS.

In former reports, it has been pointed out that certain varieties of early-maturing oats can be successfully grown in Alaska, as, for instance, Finnish Black, Norwegian, and South Dakota, all three black varieties, but in many respects the most desirable tried. In very favorable seasons, like that of 1915, several white oats have also matured. The fact remains, however, that as yet no really desirable oat is known that can be depended upon to mature every year. In 1917, Finnish Black, the earliest oat among the standard varieties, barely matured, and would not have matured if the frost had not held off unusually long. What is needed in order to be on the safe side is an oat earlier than any now planted. To this end a number of crosses have been made and some of the offspring are earlier than the parents, but, on the other hand, these hybrids do not appear to be vigorous growers, and therefore will probably not be heavy yielders. The earliest hybrids have resulted from a cross between Copperfield as the female parent and Finnish Black, or rather a

variety of Finnish Black known as Toholampi, the original sample of which was obtained from Finland direct. Copperfield is a gray oat that is fairly desirable except that it is a little too late. Finnish Black is a tall-growing, open-panicled variety above referred to. The cross is known in the station records as No. 25a. There are many selections from this series that vary slightly from each other, but all are earlier than their parents. Some of the types are apparently stable. They will be grown in increase plats and opportunity will then be afforded to compare them more closely. This series was ripe in 1917 by August 20, the earliest date recorded for the ripening of oats in that season.

Another promising hybrid is No. 36a, a cross between Black Tartarian, the mother parent, and Yakutsk (G. I. No. 498). In 1917 nearly all the selections from this cross matured August 27, a week later than No. 25a, but, on the other hand, some of the types are quite vigorous and they all have yellow and rather plump kernels. It is a somewhat remarkable fact that the black color dominant in the Black Tartarian does not appear in any of the types of No. 36a, the yellow color of the male parent being dominant. There is scarcely a doubt but that 25a and 36a will mature every year in interior Alaska. The Black Tartarian mother plant did not ripen in 1917 until September 11. There is therefore a difference of about 2 weeks in favor of the cross. It should perhaps be noted that the Black Tartarian is one of the standard varieties which has gained in earliness since it was first grown at Rampart.

Other crosses are also promising. One is cross No. 35, which is the offspring of hybrid No. 25a as the mother parent and South Dakota (G. I. No. 637). The heads crossed are numbered from a to i, and many selections have been made from them. They vary in color of grain from black to light gray, but all are early; many of the selections having ripened by August 20, which, it will be noted, is the same date the mother parent was ripe; the panicles are small; but the straw does not appear to be so strong as could be wished. As none of these types are stable, improvement in at least some of the selections may be expected.

LEGUMES.

Alfalfa.—Much has been said in former reports about the hardy alfalfas under experiment at this station, but this year there is little to say on the subject except that the seed matured last year from the various patches was seeded in the spring. This year no alfalfa seed matured. The plants bloomed profusely, but the summer was apparently too cold to ripen the seed.

Hardy vetches.—The hardy vetch, *Vicia cracca*, which has also been mentioned in former reports, grew better than ever before.

Although in former years it has matured little seed, this year more than half the blossoms bore seed, most of which matured. All of this will be sown in 1918. It is believed that *Vicia cracca* will play an important part in the future of Alaskan agriculture. It is absolutely hardy. Horses eat the green vetch greedily, and it will probably be a valuable hay plant. If sown in rows 2 feet apart it fills out the spaces between them in a couple of years and thickens up more and more each year. The chief trouble in growing this vetch has been in getting the seed. As there is none on the market, all that matures must be saved, and it has therefore not been possible to make hay from this vetch because this would spoil the seed crop. It is expected that in a few years a sufficient area will have been planted to allow the cutting of hay from a portion of it, which portion will constitute a test of how the plants stand cutting.

Peas.—Seed has been successfully matured from a garden variety of peas, perhaps the earliest pea known, which is called Alaska on the market. This pea has gained two weeks in earliness during the few years it has been grown here. It will mature its seed when regular field peas fail to do so. This year nearly 1,500 pounds of ripe peas was thrashed out at Rampart. It is expected that the Alaska will be given a place in the regular rotation, either as a hay crop or as green manure. Unfortunately it is not a vigorous grower.

None of the field peas tried have matured seed enough to perpetuate themselves.

Trifolium lupinaster.—This is a hardy perennial clover which has been grown in the same patch for some years. It matures seed in great abundance and seeds itself so as to thicken up the stand very materially. Its hardiness and its seed-producing power are valuable qualities, but it lacks leafage to give it much value as a pasture or hay crop. Possibly it may be susceptible of improvement along this line. It will be grown until it has been definitely proved to have no value from an agricultural standpoint.

HARDY STRAWBERRIES.

Nos. 320 and 275 are hybrid strawberries originated at Sitka which have proved entirely hardy at Rampart with no protection other than that afforded by the snow. (Pl. I, fig. 2.) They are of rather better quality at Rampart than at Sitka, being firmer and sweeter, probably because the summers are warmer and drier than in the coast region.

THE FIRST APPLE.

It is gratifying to announce that the first two apples ever matured in interior Alaska were grown on a Siberian crab at Rampart Station during the past season. Of a lot of a dozen of these trees and

other hardy apples sent to the station about 12 years ago only three trees are now alive, all Siberian crab. They have grown to a height of about 4 feet with a spread of 5 feet. It is not possible for the trees to attain any height, as the tops are killed down to the snow line each winter. Blooms have appeared for some three years past, but this is the first time that apples have set. The two already mentioned matured by the middle of September. It is evident that orcharding will not be one of the industries of interior Alaska.

FAIRBANKS STATION.

CHANGES IN PERSONNEL.

The Fairbanks Station has suffered a severe loss by the resignation of J. W. Neal, who has had charge of that station since the beginning of actual work in the spring of 1908. Mr. Neal came to the Alaska service in 1902, when he took charge of the Copper Center Station. His energy and practical skill were important factors in the success of that portion of the Alaska work with which he was connected. T. D. Crippen left the Alaska service June 14, 1917. M. D. Snodgrass, who has been in charge of the Kodiak Station since 1907, has been transferred to the Fairbanks Station to take Mr. Neal's place; and W. T. White, a graduate of the Kansas State Agricultural College, has been appointed an assistant at Fairbanks Station.

THE CROPS.

The entire cultivated area, nearly 100 acres, was in crops last year, about 10 acres being in potatoes, turnips for seed, and various crops on small experimental plats, and 90 acres in grain. As already remarked, it was the most unfavorable season ever experienced, and what has been said in connection with Rampart Station applies also here. Nevertheless, most of the grains matured, owing to the fact that killing frosts occurred two weeks later than is normal for that region of the country. A period of 123 days elapsed between the last frost in the spring and the first killing frost in the fall. The yields were light as compared with former years, chiefly because a period of drought during the spring and early summer retarded germination of much of the grain and stunted that which did germinate. Rains finally came in the latter part of June and during July latent seed grain started to grow, and tillers sprang out from the growing grain, producing a large percentage of late heads in which the grain never matured. A total of some 1,200 bushels of grain had been thrashed out when this report was written, with some varieties still in stack. An important fact noted during this very backward season was that certain varieties of the Siberian wheats matured perfectly. The later varieties would not have matured at all except for the prolonged frost-free season.

GRAIN HAY.

Grain hay is, and will always continue to be, an important crop in interior Alaska. No grasses have as yet been found, with the possible exception of *Bromus inermis*, which are suitable for meadow and pasture land, and until such species are found, the hay crop must be mainly of two sorts, namely, grain hay and native hay. Native hay can be found only in certain localities and in irregular patches, and experience proves that it does not stand cutting in successive years. Grain hay will therefore of necessity be the chief feed for live stock. Later it may be supplemented by alfalfa and vetches (referred to in the Rampart report), but it will be a long time before seed of these will be available for planting any considerable area. Certain varieties of oats are more suitable for grain hay than anything else, and Finnish Black oats, introduced by the Alaska stations, is the most promising variety so far discovered. Its growth is rank but the straw is not coarse. In normal years, if cut when in the dough state, it will yield 2 tons of good hay per acre, worth from \$50 to \$90 a ton.

The curing of hay is often precarious in all parts of Alaska, especially if it is not cut until late in August or early in September. A method of curing hay on racks has been practiced at the Fairbanks Station for some time which prevents heating even though the hay is put up rather green, and which gives an excellent product. (Pl. VII, fig. 2.)

RED CLOVER.

It has been demonstrated at Fairbanks Station that red clover treated as an annual will produce an excellent crop in from 70 to 90 days from seeding. The idea in introducing red clover was to use it as green manure. A plat seeded May 12 (Pl. VI, fig. 1), by the middle of August, when the writer visited the station, stood 2 feet high and was a solid mass of foliage and bloom. Part was cut for hay and part plowed under. Red clover never survives the winter in the interior, and it seldom does so in the coast region, but experience proves that it can be grown as an annual for hay, and it will, of course, furnish excellent green manure.

ADDITION TO EQUIPMENT.

The station was provided with an 8-16 Mogul tractor and a new thrashing machine. The tractor will develop 8 horsepower when used to pull farm implements or to draw loads, and it develops 16 horsepower when used as a stationary engine. In a country where it costs about \$200 to feed a horse during the year, mechanical devices that will eliminate this expense should be substituted for horsepower whenever possible. The Mogul tractor can be run with either kerosene, gasoline, or distillate, but in the far interior, where this sta-

tion is located, they all sell at 75 cents a gallon, at which price gasoline is the more economical fuel.

NEEDS OF THE STATION.

If work is to continue at this station, a dwelling is needed for the superintendent. The present quarters consist of two log cabins of two rooms each built close together. When the superintendent happens to have a large family, these quarters are inadequate. They must be shared with laborers during the rush season, some of whom have to be provided with board. A new dwelling house is needed, so that these cabins can be given altogether to the necessary help.

KODIAK STATION.

Funds are lacking to put this station in proper condition for the work designed to be done there. It is an expensive project to operate owing to the fact that there are practically two stations—one at Kodiak, where it is planned to carry on dairy work and some breeding experiments, and one at Kalsin Bay, 15 miles distant from Kodiak, where the main pastures are located and where it is designed to keep the greater portion of the herd. This necessitates frequent trips back and forth between the two places, for which purpose two power boats are kept, one the *Fearless*, only 22 feet long, and the other the *Red Wing*, 50 feet long. Owing to the location, the hay and silage must be collected from various points along the beaches and hauled to the silos and haymows at Kodiak and Kalsin Bay, an expensive process, because every forkful of hay and silage has to be handled many times in the course of transportation. The existence of two branches of the station also necessitates the maintenance of two crews of laborers and to some extent a double outfit of machinery and implements. For these various reasons the funds available for the work at Kodiak have never been adequate to provide all the equipment needed.

Buildings especially are required. A strenuous effort was made during the past season to put up some buildings and make the necessary improvements in others, but the work was not completed. Tuberculosis was discovered in the pure-bred Galloway herd in the fall of 1916. The want of a sanitary barn at Kalsin Bay is probably to blame for the appearance of tuberculosis in the herd. A set of Loudon stalls and interior fittings has been purchased for such a barn. These fittings are now on hand, but lack of funds has prevented the erection of the barn. A specific appropriation is needed to provide the necessary equipment, including not only a sanitary main barn but also a sanitary calf barn, horse barn, and sheep barn, and water systems for both Kodiak and Kalsin Bay. Two small, ready-cut, six-room bungalows, purchased in 1916 for the accommodation of

the assistants and men in charge, have been erected but not completed and are not livable at this writing.

There is need of more high-grade breeding animals to meet the requirements of the work assigned to this station and more funds to pay for the necessary supervision and labor entailed. Owing to the fact that grain can not be matured on Kodiak Island, it is necessary to buy the grain feed for the herd and ship it up from Seattle. Freight rates are excessively high (\$27 a ton for baled hay) and everything else in proportion. Labor has advanced since the war broke out. Men formerly hired for \$3 a day now demand \$4 and \$5. All these things have combined to retard the development of this very important live-stock breeding station.

The station has already done good work in demonstrating that cattle and sheep of the right breeds can be bred and maintained in that climate successfully. It is also being demonstrated that the offspring of tuberculous cattle can be kept healthy and developed into sound animals. Well-bred Holstein-Friesian cattle have been introduced, and from their behavior it is believed that they will thrive at Kodiak almost as well as the Galloways. The chief object of their introduction is for use in cross-breeding with the Galloways for the purpose of developing a race possessing the hardy qualities of the Galloway and still retaining some of the superior milking qualities of the Holstein-Friesian. The laws of heredity as brought out in such an experiment are incidentally studied. In fact, inquiries are now being received from breeders of pure-bred stock in the States.

The station has demonstrated that large-bodied, long-wooled sheep can thrive and breed successfully in that climate.

Work along all of these lines was interrupted by the fall of volcanic ash in 1912, and operations were suspended for two years, during which the herd had to be maintained in the State of Washington because the pastures were spoiled by the ash. The ash fall also caused the loss of many of the cattle and all but exterminated the flock of sheep. However, the station is again placed on a basis to go ahead with this work if the necessary funds are granted.

During the past year a strenuous effort has been made to accomplish as much work as possible with the available funds. As elsewhere in Alaska, the season of 1917 was highly unfavorable here, spring being very late, the feed period prolonged, the growth of native grass slow, and the amount of hay and silage finally gathered inadequate because of spoilage due to the heavy rains. This has necessitated the purchase of more feed than it is hoped will ever be necessary again. A strenuous effort will be made to put more land under cultivation on which to raise forage crops. In spite of the many handicaps, the work has gone along satisfactorily, and everything possible has been accomplished with the funds available.

The report of H. E. Pratt gives the details of this work.

MATANUSKA STATION.

A reservation of 880 acres for use as an agricultural experiment station was made by executive orders in the Matanuska Valley about 2 miles north of the town of Matanuska, and a special appropriation of \$10,000 for establishing this station was made in the agricultural appropriation act for the fiscal year ending June 30, 1918. With this appropriation, work was begun April 1, 1917, F. E. Rader, of California, a graduate of the Kansas State Agricultural College, who had been connected with the Alaska Experiment Stations at Sitka and Rampart from 1900 to 1908, and who was therefore thoroughly familiar with Alaska conditions, being appointed assistant in charge of the new station. Equipment consisting of a team and farm implements was purchased, also the lumber and material for the construction of a house. A dwelling house, 34 by 42 feet, and a log barn, 26 by 28 feet, have been erected, and a well 32 feet deep has been dug. A little over 12 acres has been cleared and is available for culture in 1918. No experiments whatever were undertaken, as every effort was expended in clearing land, building the house, and assembling the necessary tools and implements. A good start has been made and the work of developing the station will be pushed as fast as funds for that purpose are made available.

The climate in the Matanuska Valley has characteristics of both the coast and the interior climates. The rainfall is heavier than it is in either the Tanana or the Yukon Valleys but is not so heavy as at Sitka or other coast points. It is believed that the frost-free season will be longer than in the interior and the winters less severe, but, on the other hand, there will probably be more cloudy and rainy weather during the growing season than there is in the interior.

As the region is new, it is not possible to say at this time what particular line of farming will prove most successful. The indications are, however, that mixed farming, combining live stock and grain growing, will be the most profitable. The experiments conducted by the station will, of course, be adapted to the type of farming found most advantageous in the Matanuska Valley, the object being to aid the farmer to the fullest extent by pointing out the best methods and practices for that region. All the varieties of grain grown successfully at the other stations will be introduced and tested with the view of distributing those that prove most valuable. Horticulture will of necessity be an important feature of the work at this station. Hardy garden crops thrive well, and it is believed that a market for such crops will be found along the line of the railway and in the towns and settlements of the coast within easy access. To this end the station will be stocked in the

spring with berry bushes, fruit trees, and 40 or 50 varieties of potatoes, all of which will be sent from the Sitka Station. The various plants will be propagated at the Matanuska Station, and as fast as they become available they will be distributed in small lots to the farmers who may want them.

It seems probable that live stock will be a very important feature of farming in the Matanuska Valley. As the settlements are located on a railway, dairy products, beef, and mutton can be easily distributed to all points reached by the railway as well as to coast points via Seward. It is therefore planned to introduce live stock at the station as soon as enough land can be cleared to raise the feed to maintain the animals and funds are provided for the erection of the necessary barns and other buildings to care properly for live stock.

The most expensive item in developing the Matanuska Station will be clearing the land. The region is heavily timbered, chiefly with spruce, cottonwood, and alder trees of rather small size but standing close together. The high wages demanded will make the process of clearing slow unless funds enough are appropriated at an early date to clear 60 or 80 acres in a single year. As the ground under the trees is nearly everywhere covered with moss and small bushes, the most economical method of clearing is to take advantage of a dry spell in the summer when this moss dries out enough to burn. Under such conditions a fire will creep through the moss slowly and gradually eat its way over the shallow roots of the timber, which, when well burned, will be blown down by a heavy wind and then can be cut up, piled, and burned completely, leaving only the cottonwood stumps to be removed by powder or by a stump puller.

The soil on the station reservation and over the greater part of the entire region is of the kind called Knik loam, a medium light soil varying in color from yellow to brown and appearing to be well adapted to general agriculture.

Mr. Rader's report gives the details of the work (p. 81).

COOPERATIVE WORK.

Four and one-half tons of grain of different varieties raised at the Fairbanks Station was sent to the Matanuska Station for distribution in the Matanuska Valley in the spring of 1918. Work of this kind was begun in the spring of 1917 in that region for the purpose of introducing early maturing varieties of Alaska-grown grain to the farmers to save them the time, trouble, and expense of finding what to grow and to give them a start in raising their own grains. The small amount of grain distributed in this manner in the spring of 1917 gave results that were not entirely satisfactory, as the season

was very unfavorable and much of the grain did not mature, due mostly to late seeding. Some few farmers, who seeded their small allotments of grain early enough, matured crops which proved that grain can be grown. It is planned to continue and to extend this cooperative work, so that farmers everywhere in the Territory may be supplied with varieties early enough to mature every year. The hybrids produced at Rampart Station will, it is expected, prove most valuable for this purpose.

REPORT OF WORK AT RAMPART STATION.

By G. W. GASSER, *Assistant in Charge.*

CLIMATIC CONDITIONS.

The rainy spell which extended through the first third of October, 1916, was followed by mild, overcast days, ending abruptly at the close of the month with a temperature drop from 8° above to 21° below zero and clear skies. November began and ended cloudy, having only 6 clear days. The maximum reading for the month was 33° , the minimum -42° F. The snowfall of 4 inches brought the total up to 12.8 inches. December began cold and clear and ended cold and cloudy, with plenty of cold in between. On 3 days only did the maximum rise above zero (5° , 9° , and 7° , respectively). The spell lasting from the 1st to the 10th was the coldest on record for December, when for 8 days the minimum temperature ranged between -55° and -61° , with a maximum for the period of -50° and a mean for the month of -22.95° , the same as the mean for December, 1906, the coldest previous December on record, and 11.65° lower than the 11-year average. During the last two-thirds of the month 12.7 inches of snow fell. January, 1917, though very cold, with a mean temperature of -30.69° , lacked 6° of equaling January, 1906, the coldest on record. The minimum was -66° , while for an aggregate of 14 days the minimum temperature fell to -50° or lower. The snowfall for the month was 10.9 inches, bringing the total up to 36.9 inches. February was normal, with a snowfall of 5 inches and a mean temperature of -11° . March was cloudy and moderate, with a precipitation of only 0.6 inch of snow. With April came clear skies, there being 18 cloudless days, 12 partly cloudy, and none cloudy, with precipitation the same as for March. The total precipitation for the seven winter months was 6.26 inches (melted snow), 2.67 inches above normal; that for the five summer months was 6.79 inches, 1.14 inches above normal. The total precipitation for March, April, and May was only 0.16 inch, the least on record for any previous three consecutive months.

The summer was excessively cool, cloudy, and windy. Fortunately August was fairly warm with only 0.58 inch precipitation and no frost. With September came cloudy weather, rain falling on 10 different days and the first frost of the season occurring on the 15th. This gave a frost-free growing period of 117 days, 20 days more than the 10-year average. In the main the season was unfavorable for crop production. Except for the timely bright weather during two-thirds of August and the long overdue fall frost, much of the grain would not have ripened. However, another year of successful crop production may be recorded, the twelfth for this station.

Ice began running in the Yukon October 16, 1916, and the channel blocked and froze over November 7. Ice broke May 18, 1917. The first steamboat came May 23 and the last one left October 5.

GENERAL WORK.

Work in the field began May 11 with harrowing ground for small plat grain. The fields dried off very unevenly and slowly. Owing to the heavy late fall rains (2.88 inches in October, 1916) the ground was thoroughly soaked, especially in low places and on lowland. As fast as the ground dried it was harrowed and seeded. In this piecemeal manner the high land was finished the last week in May. South Dakota oats were then seeded on 3.5 acres of the older lowland. The newer, wetter portions of lowland could not be seeded until the end of the first week in June and even then a few spots had to be left for later seeding. There is a noticeably earlier drying off in the spring on cultivated lowland because cultivation permits the heat of summer to melt the underground beds and pockets of ice and allows the water to drain out. Two parallel ditches, made to drain the surface water down over the river bank, divide the lowland under cultivation into two fields of 14.5 and 20.5 acres, respectively. The work of laying the land off into permanent fields has been done and platting begun to the extent of setting location stakes and taking the necessary measurements. From these data a map will be drawn to scale and a blue print made.

About 18 acres of new lowland was broken this fall. On account of the rainy summer, some of the wettest of this land, about 1.5 acres, could not be cleared of moss because the piles were too wet to burn. On about 2 acres of land up the river beyond the present field boundary, the stumps were dug up and piled with the dead-fall and other litter. This makes about 12 acres on which the stumps and trash have been piled. Next spring or early summer, when conditions are right, this area will be burned over.

The old log building formerly used for a stable and hay shed was torn down. This was erected 11 years ago with a dirt roof, and the roof timbers had become so rotten as to make it unsafe. The walls

were rotten in part only, and from the sound logs and such new logs as were necessary, a cabin 14 by 16 feet was constructed. It is situated near the barn and serves as a dwelling for the teamster. A small 10-by-12-foot building of corrugated iron was constructed at some distance from all the other buildings. In it are kept gasoline, kerosene, paints, and oils in order to safeguard the other buildings from fire hazard.

On the last boat, the station received a small thrashing machine, Champion No. 1, which was transferred from the Fairbanks Station because a larger machine was needed there. The Champion No. 1 was belted up to a Cushman 4-horsepower gasoline engine. More power would be better as the straw is usually quite tough, consequently it was found expedient to discard the straw carrier and tailings elevator, in order to put all available power into the cylinder. Oats, wheat, rye, and peas were thrashed; details as to yield and other particulars are given under proper headings.

LEGUMES.

Alfalfa.—Three fields of *Medicago falcata* are now growing. One is an irregular field in a draw of about 1 acre in extent, the lower and older portion of which was started in the spring of 1915 with plants transferred from a plat seeded in 1911. Another plat of 1.25 acres was seeded last spring on lowland. This spring 6 acres was also seeded in lowland, producing a good stand except on the upper end where seepage water invaded from adjoining unbroken land. All the above seedings are of station-grown seed drilled in rows 3 feet apart (with a Planet Jr. No. 4), the drill being followed by a loaded wheelbarrow having a solid 3-inch wheel. Going over each row twice with this wheelbarrow thoroughly compacted the soil and brought the seed into intimate contact with the moist soil underneath, a necessary condition to efficient germination.

On June 2 an application of liquid pure culture for alfalfa was applied to three rows of 2-year-old plants. The culture was mixed with dry earth according to directions and applied with a hand drill. Owing to delay en route the culture passed the 30-day limit of viability before it was received. An examination made late in September failed to disclose any nodules whatever either on treated or untreated plants.

Practically no alfalfa seed ripened this season, though last year 12 pounds was harvested from a little less than 0.25 acre. The growth was vigorous and the plants began blooming as early as usual, but many of the earliest blossoms failed to set fruit, and the pods that did form developed very slowly during the cool, rainy July. Pollination of alfalfa is dependent to a very great extent on the work of bees, of which there are a number of species here and which

are very active in normal seasons. This year their number was markedly reduced, and butterflies, fairly numerous during June, disappeared almost entirely for the rest of the season. Next year, from the area now seeded to this valuable legume, there should be produced several bushels of seed.

The plat of Grimm alfalfa wintered almost perfectly. In fact, this year there were fewer dead plants than in the previous year with the exception of one small spot where a deep drift lingered until the middle of May and where practically every plant was killed. However, enough seed had shattered out the previous fall to make a full stand, young plants having sprung up throughout the plat so that the stand has improved over previous years. Very little seed ripened, the same adverse conditions militating against seed production as with yellow-flowered alfalfa. In 1916, 20 pounds of Grimm alfalfa seed was secured.

The plats of Hardy Grimm and Disco seeded three years ago are practically out of the race. Neither ever made a satisfactory growth and each spring saw fewer survivors and lessened vigor. The plats have been seeded with *Vicia cracca*.

The few plants of Obb and Omsk alfalfa made a rank growth. No seed ripened this year and very little in previous years. Both are procumbent in growth and consequently not satisfactory for hay production.

Vetch.—*Vicia cracca* has again demonstrated that it deserves a place as a forage plant in the crop rotation of an Alaska farm (Pl. II, fig. 1). This year when both *Medicago falcata* and Grimm alfalfa failed almost completely to ripen seed, this vetch ripened from 50 to 75 per cent of its seed. Spreading by means of rhizomes, it covers the ground in two or three years to the complete exclusion of weeds. This vetch is growing on a very poor piece of land extending over a knoll. The ground has never been manured and in its pristine state of fertility did not produce grain enough to pay for the labor, yet it is on this land, the poorest on the farm, that *Vicia cracca* annually covers the ground with a viny mass, waist high in the moister parts of the plat. An examination this fall showed well-developed root nodules on both the old and new seedings. No culture has been applied at any time.

Peas.—On May 18 one acre was seeded with station-grown seed of garden peas of the variety Alaska, a smooth, blue pea that has demonstrated its earliness in several successive years. (Pl. II, fig. 2.) Planting was successfully accomplished by means of a two-horse seed drill, a good stand resulting. The first blooms appeared on June 26 and by July 12 the peas were of edible size. A considerable quantity of ripe pods was hand picked the third week in August. By September 14 many of the vines and remaining pods were entirely

ripe, and they were then pulled and left in piles to cure as much as possible. The growth was not strong, but the vines fruited abundantly. Having been grown for 11 years here the plants have become noticeably dwarfed, but to offset this there has been a gain of nearly two weeks in earliness.

All the peas from the above field were thrashed October 18 with the newly acquired Champion No. 1. By substituting blanks for the regular concaves, few if any of the peas were split. The yield in pounds was 1,490. The crop on one corner of the field which became very foul with weeds was turned under August 3, and another corner which was too wet to seed with the main body was broadcasted later and the peas harrowed in. With these two fractions of the field counted out, there was an area of 0.875 acre. Estimated on this basis, the yield per acre was 27.93 bushels of 60 pounds each. Well-developed nodules on the roots were fairly abundant, although no culture had been applied, the plants bearing nodules occurring in groups near which no nodules could be found.

One-fourth acre was planted with Irkutsk field peas (No. 78-3). These peas were soaked a couple of days prior to planting and had short sprouts. They were hand planted in rows 20 inches apart. The stand was excellent and the growth vigorous. By July 20, the pods were filling and vines thrifty. The crop was harvested September 14, by pulling and piling the vines. Thrashed October 18, as was the preceding variety, they yielded 230 pounds, or at the rate of 15.32 bushels per acre. The yield is not comparable with that of Alaska, inasmuch as Irkutsk was sprouted and hand planted in 20-inch rows and Alaska was machine sowed. The Irkutsk pea is small, smooth, and yellow. While not so early as Alaska, it is a promising field variety and will bear growing in comparison with the above well-known garden sort.

Liquid pure culture from the department was applied May 30 in the same manner as to *Medicago falcata*. The pea culture, like the alfalfa culture, was delayed en route and was too old to be effective when received. Root nodules have been found in various places on different legumes where no germ culture has been applied, the evidence being that nodule-forming bacteria are indigenous to this soil. On the hills a few miles from the station, wild *Vicia* plants are growing. An examination of the root systems of these and other legumes will be made next summer to ascertain whether or not root nodules are present.

A few seed of each of the two wild peas (probably *Lathyrus maritimus* and *L. palustris*) were received this year and will be planted next season.

A short row of each of two new field peas from Tulun Experiment Station, Russia, was planted on May 23. No. 367-1 is a small,

smooth, yellow, half-dwarf variety, growing to a height of 30 inches or less and bearing pods 2 to 2.5 inches in length. It did not prove prolific nor very early, some ripe pods being gathered late in the season. No. 366-1 is a decided dwarf, the taller vines being only 8 inches in length. The vines produce from 2 to 6 pods 2 to 2.5 inches long, containing from 4 to 7 large, wrinkled, gray peas each. This pea is early, and practically the whole crop ripened.

Chick peas (*Cicer arietinum*), department seed, were tried for the first time. These are as follows (the Office of Foreign Seed and Plant Introduction number is followed by the Rampart Station number): Nos. 21784-C. P. 339, 22736-C. P. 340, 24889-C. P. 341, 21786-C. P. 342, 32096-C. P. 343, 27815-C. P. 344, 26193-C. P. 345, 26990-C. P. 346, and 32088-C. P. 347. The seed was well sprouted and planted May 23. The peas came up June 2 and began blooming July 12. Nos. 340, 344, and 345 had white blossoms, the others purple. The height at blooming time was 6 to 8 inches, at the end of the season 12 inches, except No. 347, which was 18 inches high. The pods are short and hairy and borne singly at the nodes; the peas, generally two to a pod, are wrinkled and the size of a small garden pea. The plants were perfectly green when killed by frost late in September.

Clover.—In order to test the value of using red clover as a soiling crop, 1.5 acres was broadcasted and harrowed May 19, using 20 pounds of seed. The stand was excellent, though the clover grew very slowly and in spots. The first blossoms appeared July 31. By fall the best plants were 20 inches high and looked thrifty, but the growth on the poorer spots was not more than half as high and lacked a healthy color. The ground was well covered throughout the field when plowed October 4. A very few plants were found having small root nodules, but there was not an abundance on any plant.

Trifolium lupinaster, as stated in last year's report, is so unvarying in its behavior from year to year that there is nothing more to add (Pl. III, fig. 1). Its perfect hardiness and unfailing seed production commend it, but its growth is so lacking in vigor that it is almost valueless as a hay plant. The stand is thickening up gradually in the plat seeded in 1914. The ripe heads were pulled and will probably produce a couple of pounds of clean seed. A new plat will be seeded next spring in a different soil. The present plat is on the characteristic brown silt loam found on the benches along the Yukon.

WINTER GRAIN.

Since winter grain ripens so late here that it can not be seeded the same fall, it is virtually a biennial—that is, the seed ripened this September will be seeded next August and will be ripe two years hence.

Small plat seedings made of winter rye and winter wheat August 13, 1916, were harvested September 13, 1917. With the exception of Kharkov wheat, the stand was excellent and full, the vigor fair to excellent. In the following plats of winter grain, wherever the number of kernels is given, the seed was planted by hand in rows 20 inches apart, 50 kernels to the row, spaced 4 inches. This was done by means of a planting board, 6 inches wide and 16.5 feet long, having a row of inch holes down the center 4 inches apart. A dibble having an adjustable gauge was used to make the holes in the earth. This method was used for all grain where single heads were planted.

WINTER WHEAT.

Plats Nos. 1 and 10, Kharkov (S. P. I. No. 12001, Sta. No. 204-11).—This wheat has been grown for 11 years from station seed, the percentage of germination having always been low and the vitality of the plants weak. Each year the major portion has been winter-killed. The straw is generally of good length but weak, the heads large, well filled, with widely spreading awns; and the grain plump, large, amber, and medium hard. Careful selections have been made from year to year, but there has been no improvement whatever. In fact, last winter for the first time this wheat froze out completely.

Plats Nos. 2, 6, and 7, Sandomirka (No. 203-2).—Seeded for the second time, this wheat also froze out completely. The first year it made a good showing and seemed to be hardier than Kharkov. The heads have terminal beards only, the glumes and grain are light colored.

Plat No. 5, hybrid No. 45a (Kharkov \times Sandomirka).—Of 62 kernels planted, 61 germinated, all of which winterkilled.

Plat No. 20, winter wheat No. 348.—This wheat was given its first trial and winterkilled completely.

Plat No. 21, winter wheat No. 349.—In a first trial, on a plat 2 rods square, 24 plants survived. The growth was rather weak, and because of the thin stand the plants tillered excessively, producing many small green heads. The straw reached a height of 26 inches and the best heads were 3.25 inches long and contained 35 grains, none of which was fully ripe when harvested September 13, two days before the first frost.

WINTER RYE.

Plat No. 26, Brandon winter rye.—A field of 4.5 acres was seeded August 2, 1916. This field had been cropped to oats, which was cut for hay just previous to seeding the rye. The soil is poor and so loose in places that the binder made tracks 2 and 3 inches deep; also a portion of the field consisted of knolls, from which the winter winds cut the snow. Consequently it was decided not to plow the ground as the

stubble would loosen the ground still more if turned under, while the unplowed stubble would hold the snow on the higher portions. The seed was not first-class and the stand not more than 75 per cent. None winterkilled. The growth was not heavy anywhere, but was best on the knolls, where in previous years it was poorest, the improved growth no doubt resulting because the oat stubble held the snow on the knolls, thus affording protection from the cold and furnishing moisture for spring growth. The height ranged from 30 to 40 inches. The grain on the knolls was harvested August 31, the rest on September 4. Owing to the thin stand, the field in places became foul with weeds. Because of the poorer stand on the lower side of the field, 1.5 acres were disked in the spring and seeded with oats, leaving 3 acres from which the rye was thrashed October 20 with a yield of 27 bushels.

Plat No. 3, hybrid No. 39a (Giant French \times Amber).—The 89 kernels planted produced a 91 per cent stand, 35 per cent of which survived. None winterkilled. The plants had excellent vigor, reaching a height of 45 inches and producing many green tillers, but there were very few good heads, most of them being partly sterile. One plant with 8 heads was selected for further trial.

Plat No. 4, hybrid No. 37a (Sta. No. 195 \times No. 196).—Sixty-seven kernels were seeded, giving a stand of 98 per cent, 90 per cent of which survived, the behavior being much superior to hybrid 39a, as a number of excellent plants was produced. On September 9, seven plants were selected having respectively 18, 12, 9, 15, 7, 5, and 15 heads. All plants tillered excessively, some having as many as 50 tillers, most of which bore green and sterile heads. The above is true of all hand-planted winter rye, partly because of an abundance of room, also an overabundance of moisture and cool weather during July.

Plats Nos. 8 and 9, G. I. No. 281 (Sta. No. 193-V1, V2).—Two plats were sown. For one the parent head contained 114 kernels, 100 of which were used, giving a 100 per cent stand and 99 per cent survival. For the other plat a parent head of 97 kernels was used, a stand of 98 per cent resulting, of which 100 per cent survived. In the fall of 1915, a single plant having very large bushy looking heads, due to abnormal development of the lateral spikelets, was found in a large field. Two ripe heads were saved and numbered V1 and V2, preceded by the variety number. The young plants raised from them grew spreading instead of erect, as is the habit of winter rye. Each head, as it emerged from its boot, proved a disappointment, none possessing the bushy appearance of the parents. Finally, after a careful search, five heads were found with the characteristics sought, but unfortunately all were small and green, having been borne on some of the late tillers. The best that could be done was to save all the ripe heads, most of which were broad, well filled, and from 3 to 5

inches in length, containing 40 to 70 kernels. The plants at least showed that this type is different from the stock variety, but future generations only can tell whether the variation is fixed.

Plat No. 16, winter rye No. 193-4.—The parent head was from the same variety as the preceding and contained 81 kernels, giving a stand of 98.8 per cent, 99 per cent of which survived. The young plants were erect and headed June 19, three days earlier than the V1 and V2 plants. The heads were slender and long, but not so well filled as those of the above variants, nor did the plants tiller so much. This type and the two above ripened on the same date.

Plats Nos. 11 and 14, S. P. I. No. 1134 (Sta. No. 198-6).—One head was planted to each of two rows. The parent head of plat No. 11 was slender with 42 very plump kernels resembling wheat. A stand of 95.5 per cent resulted, of which 98 per cent survived. The offspring had culms 48 inches in height and heads 3 to 4 inches in length, containing from 30 to 50 very plump kernels. Many of the heads were half sterile, a very serious and common fault in both winter and spring rye. In plat No. 14, the parent head was slender, having the characteristic slender grain of rye and containing 50 kernels. A stand of 98 per cent was obtained, survival 100 per cent. The general average was better than the first row, as there was less sterility, and although the heads averaged the same length, the number of kernels per head was greater by 10.

Plat No. 13, Giant French (No. 199-7).—A head of 62 kernels gave a stand of 100 per cent, survival 94 per cent. This is a good, medium-early variety with long, broad heads containing from 40 to 70 large kernels.

Plats Nos. 15 and 17, Swedish (S. P. I. No. 11556, Sta. No. 195-2).—In the first of these plats, the parent head was medium long, the grain short and very plump with 39 kernels, giving a stand of 100 per cent, of which 99 per cent survived. This plat made the poorest showing of any, producing medium short straw and small, green heads, only 14 of which were good. These had plump grain and were well filled. In plat No. 17, the parent head was long with long kernels numbering 56, which gave a perfect stand and survival. The grain grew to the same height as that on the first plat, 44 inches, but had somewhat better heads, very few of which ripened.

Plats Nos. 18, 19, and 25; Irkutsk (No. 201-2).—The parent head of plat No. 18 was medium long and erect, having 53 medium plump kernels, which gave a perfect stand and survival but made a very uneven growth. Many of the heads were practically sterile, though a few good heads at the end of the row contained as high as 60 kernels. In plat No. 19, the parent head was long, with 58 long, slender kernels. The stand was 98 per cent, the survival 100 per cent. The growth characteristics were the same as those on the first plat. Plat

No. 25, of 0.0156 acre, gave a stand of 50 per cent, survival 100 per cent. Tillering was not so excessive as in single rows, the tillers numbering 2 to 10 per plant. The culm reached 50 inches in height, the heads 3 to 4.5 inches in length, but they were imperfectly filled. The yield of grain was 27 pounds, a rate per acre of 30.8 bushels.

Plat No. 22, winter rye No. 324-1.—A first trial of this variety was seeded on a plat of 0.0125 acre, a stand of 75 per cent and a survival of 100 per cent resulting. The grain grew to a height of 50 inches with long, slender heads containing from 30 to 70 kernels. The yield of the plat was 19 pounds, a rate per acre of 27.1 bushels.

Plat No. 23, winter rye No. 351-1.—A first trial on a plat of 0.0125 acre gave a stand of 75 per cent, survival 100 per cent. The resulting crop was very similar to that from winter rye No. 324-1, except that the heads were smaller. The plat yielded 20 pounds, or at the rate of 28.4 bushels per acre.

Plat No. 24, winter rye No. 350-1.—A stand of 75 per cent, of which 100 per cent survived, resulted from a first trial on a plat of 0.0125 acre. Though the growth was uneven, some of the plants reached a height of 50 inches with long, slender heads containing from 30 to 60 kernels. The yield of grain was 17 pounds, or at the rate of 24.2 bushels per acre.

SPRING GRAIN.

Plats were located just back of the cottage on typical brown silt loam in a field cropped the previous year to potatoes. Due to very uneven drying caused by a couple of heavy snow drifts, there was a difference of eight days in time of seeding. Plats 14 to 77, inclusive, and 94 to 155, inclusive, were single-head selections of 1916 and were hand planted, using the planting board as described under winter grain.

SPRING WHEAT.

Plats Nos. 1, 2, and 14; H. G. (No. 82-4).—This wheat is a Russian variety having short straw and a short-bearded head. The first two plats consisted of 2 and 3 drill rows, each 1 rod long, seeded May 21 with several heads selected in previous years for earliness. The plants reached a height of 30 inches, with heads 2.5 inches long containing from 40 to 60 kernels each. Plat 14 was seeded May 13 with a single head of 50 kernels which gave a 70 per cent stand and reached a height of 30 inches, with heads 2.5 to 2.75 inches long, containing 50 to 60 grains. There was no lodging. The crop was harvested from all three plats on September 10.

Plats Nos. 3, 4, and 5; hybrids Nos. 29d-1-1, 29d-1-2, and 29c-1-1 (Chogot×Irkutsk).—Seeded May 21, the crop was harvested September 10. The first two hybrids resemble Chogot very closely, but

have heads better filled at the tip. The height of straw was 30 inches, length of heads 2.5 inches, number of grains per head 40 to 65. None lodged. Hybrid No. 29c-1-1 has light-colored glumes and short, broad heads, and is bearded like the parents. This hybrid did not ripen, but otherwise resembled the other two.

Plats Nos. 15 to 20, hybrids Nos. 32a-1 to 32a-6 (Chogot×Romanow).—All in this series (Pl. IV, fig. 1) have bearded, dark-glumed heads, resembling those of Chogot but averaging an inch longer and containing from 5 to 10 more kernels. The height of the shortest was 36 inches, the tallest 44; length of heads, 3 to 4 inches; number of grains per head, 50 to 72. No. 32a-4 proved worthless, having many green tillers. Selections were made from the other 5 for further trial. The grain was seeded May 14 and harvested September 10. There was no lodging.

Plats Nos. 21 to 32, hybrids, Nos. 30a-1 to 30a-12 (Chogot×Marquis).—In this series (Pl. IV, fig. 1) the following proved inferior and no selection was made: Nos. 30a-1, 2, 3, 4, 9, and 10. All of these had poorly filled heads, especially at the tip, while 30a-5, 6, 8, 11, and 12 were not stable, in each case there being both smooth and bearded heads and light and dark glumes, though many of the heads were excellent, containing as high as 75 kernels. The best of the lot was No. 30a-7, which had clean-looking heads from 3 to 3.5 inches long with terminal beards and straw 36 inches tall. This hybrid resembles the staminate parent. All of the above series were seeded May 14 and harvested September 10, none of the straw lodging.

Plat No. 148, hybrid No. 29d-4-1 (Chogot × Irkutsk).—A head of this hybrid was selected last year, containing 61 long amber kernels and being bearded with dark glumes. The best head in the plat this year contained 70 kernels. In length of straw, length of head, and color of chaff, the hybrid resembled Chogot very closely, but it had larger heads than the Chogot growing in an adjoining plat. It also ripened on the same date as Chogot, August 30.

Plat 149, hybrid No. 53a (Romanow×Marquis).—Seven kernels of this hybrid were planted, of which 6 germinated. Of the resulting 6 plants, 4 were bearded and 2 were smooth. The bearded were the larger and earlier, but all were late, none ripening before September 10. The best bearded head was 4.25 inches long and rather open, containing 60 kernels.

Plat 150, hybrid No. 54a (Marquis×Ulka).—Six kernels were planted, 4 of which germinated. All heads were smooth and medium sized, and contained from 40 to 50 kernels. The crop was harvested September 10.

Plat 152, hybrid No. 56a (Ulka×Velvet Chaff).—Only 4 kernels were planted, 3 germinating. Two of the resulting plants bore

smooth heads resembling the staminate parent, while the other plant bore heads resembling the pistillate parent. The former heads were the larger, some 4.25 inches long, but very open, containing only 56 kernels. Good, strong plants were produced 40 inches high, all of which were late. The crop was harvested September 10.

*Plats Nos. 87 and 158 to 163, inclusive, Chogot (No. 133-4).—*Except for plat No. 87, which was 1 rod square, the above plats consisted of 2 drill rows 2 rods long. These plats represent different selections made during 1914, 1915, and 1916, in an endeavor to isolate a strain having more desirable qualities than the original, which was first grown in 1914. The chief point of excellence of Chogot No. 133-4 is earliness. The heads are small, bearded, and not well filled at the tip, the glumes dark and open, resulting in considerable loss by shattering when ripe. The straw is short, in fact, too short, being scarcely long enough to cut with, the binder on poor ground. This is a very stable form and consequently offers very little opportunity for improvement by selection of individuals. There was a discouraging sameness in the plats growing side by side. However, plat No. 163 showed a little variation in that it was a couple of inches taller and 2 days later than the others and also had slightly larger heads, the largest being 2.75 inches long and containing 50 kernels. The average heads contained 45 kernels. All of the plats were harvested August 30, except No. 163, which was harvested September 1. Selections will be continued.

Plat No. 217, Chogot.—An irregularly shaped field was seeded with this wheat May 24, which was as early as the condition of the ground would permit. About 0.5 acre was new land cropped for the first time; the rest of the plat was in oats last year. The stand was most excellent and the early growth good, but the grain began to head when only 8 inches high, and the tallest was only 24 inches when cut. Sometimes new land produces a good crop, but in this case the wheat on the new land was an absolute failure except on the few spots where roots and moss had been burned. The field was harvested with a binder September 5 and the grain left in the shock until October 10, when it was thrashed, yielding 34 bushels.

*Plats Nos. 156 and 157, Tulun (No. 306-3).—*This is another Russian variety having the same characteristics as Chogot. It averages 33 inches in height with heads averaging 2 inches in length and containing from 20 to 40 kernels, which are amber in color, small, hard, and angular. The grain ripened August 30.

*Plats Nos. 164 and 192, Marquis (No. 131-4).—*This is one of the wheats that failed to ripen. The fact that it has ripened heretofore in the same time as Romanow and Ladoga would seem to indicate that it requires a higher summer temperature than these two. Mar-

quis is a semismooth variety having short terminal beards; light-colored, clasping glumes; and plump, medium-hard grain.

Plat No. 196, Romanow (No. 127-3).—This plat contained 0.024 acre and was seeded May 14. The grain reached a height of 42 inches with bearded heads from 3 to 4 inches long, bearing dark-colored glumes, and containing from 40 to 50 kernels. The grain was large, plump, and amber colored. Harvested September 11, the plat yielded 57 pounds of grain, a rate per acre of 39.6 bushels. This is a good sort, but a little too late.

Plat No. 193, Ladoga (No. 127-3).—This plat, containing 0.028 acre, was seeded with Ladoga on the same date as the Romanow above, also ripening on the same date. Ladoga and Romanow are nearly identical in appearance. The yield of the plat was 60 pounds, a rate per acre of 35.7 bushels.

Plats Nos. 165 to 176, Russian wheats.—These plats were seeded May 21 with wheat originally from the Tulun Experiment Station, Russia, tried here for the first time this year. All were harvested September 5 and were uniformly 90 per cent ripe, 7 of the varieties resembling Chogot so closely that no further description is needed. The remaining 5 varieties were very much alike, reaching a height of 33 inches, with bearded heads 2 to 2.5 inches long containing from 20 to 40 grains; glumes light colored; kernels small, hard, angular, and amber.

BARLEY.

Plats Nos. 11, 78, 93, 115, and 122 to 126; hybrids Nos. 28a and 28e (hybrid No. 14e-1×G. I. No. 279).—All barleys in this series are black and 6-rowed, but in time of ripening and in other qualities there is a wide range. For instance, 28a-1-1-6 ripened August 14, the second earliest barley to ripen this year, while 28a-1-1-7 ripened August 24 and others September 1. None has proved a strong grower. The heads are short to medium long and well filled, having from 40 to 60 kernels. The hybrid ripening August 24 is stable in form and color, being hooded, black, 6-rowed and hull-less, with a height of 36 inches, heads from 2 to 3 inches long, number of kernels from 40 to 54 per head. While not so vigorous as others, its earliness and uniformity give it value. Several in the series are still breaking up into bearded and hooded types. Hybrid No. 28a-1-1-3 had some fine heads 4 inches long with 72 kernels. This form is bearded and stable. Possibly on account of the unusually heavy heads most of it lodged just before it was cut on September 1. The necessity of treating each head from a plant as a unit is shown by the fact that 28a-1-1-1 and 28a-1-1-2 were taken from the same plant in 1916. The heads were identical in appearance, being black, hooded, hull-less, and 6-rowed, but from the former came both

bearded and hooded heads, from the latter only hooded. No. 28a-1-1-4, which is bearded, shows a fugitive tendency to shed its awns when ripe, leaving a very clean-looking, attractive head. Selections will be made for several generations to determine the possibility of fixing this characteristic.

Plats Nos. 13, 88 to 92, 110 to 114, 116, and 117; hybrids Nos. 14a and 14b (S. P. I. No. 19851 × G. I. No. 362).—This cross has resulted in widely divergent forms, hooded, bearded, black, yellow, purple, hull-less, hulled, 2-rowed, and 6-rowed. Naturally many have been discarded and many others will be. Although in the fifth generation the splitting up process continues to some extent, a few strains are apparently stable. Three hull-less types have been selected, the first 6-rowed, hooded, and yellow; the second 2-rowed, hooded, and yellow; and the third 2-rowed, hooded, and purple. Of the 6-rowed type, No. 14b-2-1-1-1-1 is a typical and apparently stable form, which reaches a height of 54 inches with nodding heads from 3 to 4.75 inches long, containing from 50 to 75 kernels. This form produces a fine, vigorous plat. Typical of the yellow, 2-rowed sort is No. 14a-2-2-1-2, which has a good length of stiff straw (46 inches) and bears well-filled heads from 3 to 3.75 inches long with 20 to 26 very large kernels in a head. This hybrid is apparently stable. Hybrid No. 14a-2-3-1-2-1, also apparently stable, is identical in form with the above except that it has purple glumes and dark-colored kernels.

Plat No. 81, hull-less barley S. P. I. No. 12709 (Sta. No. 120-11).—Two drill rows of this variety seeded May 14 were ripe August 29. The straw was short and weak, 75 per cent lodging. The heads were from 2 to 3 inches in length and fairly compact, having 40 to 50 plump, amber grains with both ends quite pointed, a distinguishing feature as compared with wheat. This barley has been used as mother parent in a number of crosses. Of them all, only the 19b series possesses merit worthy of note. The splendid heads and sturdy straw of the progeny make it hard to believe that this short-headed, weak-strawed barley was the pistillate parent.

Plat No. 82, hybrid No. 2a-1-1-1-1 (hybrid No. 1A-1 × Abyssinian, G. I. No. 362).—This small increase plat was seeded May 14 and ripened three months later lacking one day. It was the earliest to ripen, although it had a close second in hybrid No. 28a-1-1-6. No. 21a-1-1-1-1 is a 2-rowed, hooded, and black barley, virtually a facsimile of its staminate parent minus the beards. As yet it is not stable, showing both bearded and hooded types, all 2-rowed.

Plat No. 83, Boehmer (S. P. I. No. 19851, Sta. No. 130-10).—A small increase plat was seeded May 14, which ripened August 29, reaching a height of 30 inches. Like that of S. P. I. No. 12709, the growth was weak. These two hybrids are identical in appearance

and growth characteristics. No. 19851 has also been used repeatedly in hybridizing because of its hull-less quality. It was the pistillate parent in the 14a and 14b series which rival the 19b series in length and strength of straw and size of hand.

Plat No. 84, Chittyna (No. 119-7).—A small plat was seeded and harvested on the same dates as the above. This is a hooded, 6-rowed type, with medium strong straw and fair-sized heads. Selections have been made with a view of stiffening the straw.

Plats Nos. 118 to 121, hybrids Nos. 44c-1 to 44c-4 (hybrid No. 20b-1×Pamir S. P. I. No. 18922).—Both parents of this series are very early. Pamir has short bearded heads and very short straw; hybrid No. 20 b-1 is hull-less having medium large heads. Last year the cross between the two was disappointing in point of earliness. Hybrids Nos. 44c-1 to 44c-4 are from 4 heads selected from a population of nearly 200. They produced a generation little, if any, better than the first. The straw lacked strength, though the heads were fair sized, containing from 10 to 50 kernels. All were apparently stable, being hooded, 6-rowed, yellow, and hull-less. The grain was ripe August 29.

Plats Nos. 127 to 132, hybrid No. 19b (hybrid No. 1a-3×S. P. I. No. 12709).—The first generation of this promising hybrid was grown in 1913 (Pl. IV, fig. 2). It is therefore in its fifth generation. As both the parents were hooded, 6-rowed types, the offspring have been less divergent in form than in, for example, the 14a and 14b series. The manifestations of variation were to be found chiefly in color of glumes, as yellow, striped, or purple; and character of kernel, as hull-less or hulled. All of the present generation are hull-less and have either yellow or striped glumes, the striped form predominating. This series is characterized by great vigor, as evidenced by breadth of leaves, length and thickness of culm, and size of head. The height of the mature plant was 48 inches, the length of head 4 to 4.5 inches, with an occasional head 5 inches long, and the number of kernels per head 50 to 75, these being hull-less, dark, and angular. Seeded May 15, the earliest heads were ripe August 29.

Plats Nos. 133 to 138, hybrid No. 20b (hybrid No. 1a-1×G. I. No. 279).—In 1913, one plat of this hybrid seeded May 12 was ripe July 21. Pamir and G. I. No. 279 ripened in a like period. That record still stands. This year hybrids Nos. 20b-1-1-2-3 and 20b-1-1-2-4 required 98 days to ripen, 18 days longer than they required four years ago, a good indication of the character of the past summer. The 20b hybrid is 6-rowed, hooded, hull-less, and yellow, with straw of medium length and average sized, well filled, fairly compact heads.

Plats Nos. 139 to 145, hybrid No. 1a-4 (Champion×Pamir).—Seeded May 18, these plats were harvested August 29. This series is



FIG. 1.—TRIFOLIUM LUPINASTER IN BLOOM, RAMPART STATION.

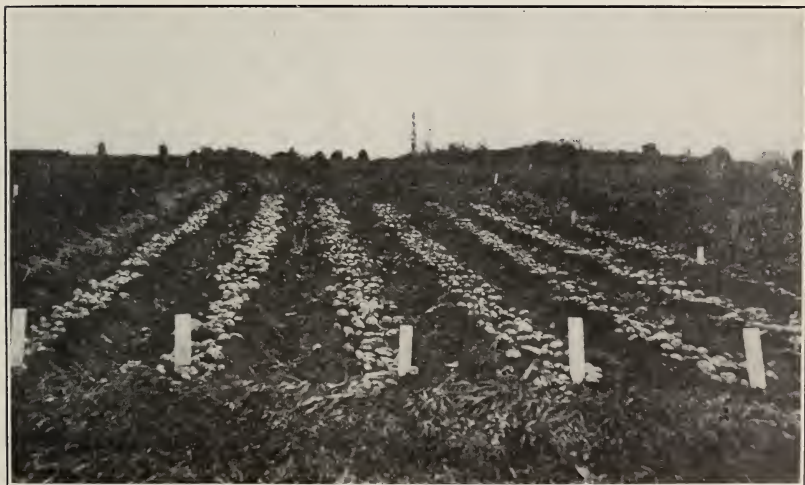


FIG. 2.—POTATOES IN GOOD SOIL, RAMPART STATION.

Left to right, Irish Cobbler, Burpee's Superior, Late Puritan, Early Six Weeks, Gold Coin, Knowles's Big Cropper, and Netted Gem.



FIG. 1.—SOME HYBRID WHEATS PRODUCED AT RAMPART STATION.

Nos. 4 to 12, Chogot×Marquis; Nos. 1 and 2, Chogot×Romanow.



FIG. 2.—HYBRID BARLEYS, RAMPART STATION.

6-rowed, hooded, and yellow, with partial sterility as one of its faults and weakness of straw as another, although none lodged this year. Last year 4 heads with nonsterile tips and 3 with sterile tips were selected, and this spring each head was planted separately. Heads with sterile tips were found in all seven rows, indicating broadly that all heads are carriers of this quality. Further selections will be made to test this matter more thoroughly.

Plat No. 183, Manshury (No. 136-10).—This standard sort has been grown continuously for 11 years. It is a pure line and a consistent cropper. It is grown here only as a check on the performance of the hybrid barleys, as it is bearded and rather late. Seeded May 21, it was not ripe until September 14. The height is about 38 inches and the heads have 40 to 60 kernels.

Plat No. 185, Gold (No. 322-2).—This is a 2-rowed, bearded hulled sort, having long slender heads, with purplish glumes bleaching to yellow as the grain ripens. It reaches a height of 38 inches and is medium early, the crop seeded May 21 having been harvested August 31.

OATS.

On May 23 a 5-acre field located on high bench land was seeded with Finnish Black oats. This is the third year the land has been cropped. The stand was excellent and the growth fairly strong and uniform. The field was cut with the binder August 31, when the grain was not all ripe, but it was thought best to safeguard next year's crop supply in case freezing weather should set in. The grain was left in the shock until thrashed September 10. The yield per acre was 36 bushels.

A 1-acre field of oats of the same variety as the above was seeded May 30 on side-hill land which had been summer fallowed the preceding year. The oats grew quite thick and rank and consequently ripened comparatively slowly. During a rain and wind storm from the northeast on September 7 to 10, the oats lodged flat and had to be cut one way with the binder on September 14 just before the first frost of the season. This field thrashed out 70 bushels.

Another field of 3.5 acres was seeded with South Dakota (G. I. No. 637) oats May 26. Except for that from 1 acre which was on new land, the crop was excellent. It was ripe and cut with the binder September 5. As this grain is intended for horse feed, it will be fed out of the sheaf.

About 5 acres of new bottom land was cropped with oats for hay, having been seeded as rapidly as it could be worked in the spring, beginning June 6 and ending June 14. On most of the field the crop was good, but a part was spotted, as is often the case on new land.

This field was cut with the binder September 14. The grain was set up in small shocks and left in the field until hard freezing weather would prevent its heating when stacked. Seven big loads of first-class feed were secured.

Oats was seeded for hay on 8 acres of bottom land, part of which had been cropped 4 years and part 2 years. On the older portion a good crop of winter rye was grown 2 years ago, but every year the oat crop has been very light, and this year was no exception. On August 7 the plow was started and the whole field was plowed deep, turning the green oats under thoroughly. On most of the field it was possible to reach the gray, sandy subsoil at a depth of from 6 to 8 inches, but in places the black, peaty surface soil puts the subsoil beyond the reach of a 12-inch turning plow. Such areas would undoubtedly be benefited by lying idle during a dry season and then having the top inch or two burned off.

Plat No. 190, Norwegian (No. 117-3).—This is a pure line started from a single head three years ago. The oat is black and paniced, with medium-sized heads, having large, fairly plump kernels; not a tall growing sort but an early and consistent cropper. A plat of 0.032 acre was seeded May 15 and harvested August 25 with a yield calculated on acre basis of 53.6 bushels.

Plat No. 191, hybrid No. 25a-1-2-1-1 (Copperfield×Toholampi).—This paniced oat has medium sized, open heads and slender gray kernels with a purplish bloom. The fifth generation was produced this year and it runs true to color and form. The 0.032-acre plat of this hybrid seeded May 15 was the earliest ripe, two-thirds of the plat being cut August 14, the rest August 23. The yield of grain calculated on acre basis was 42 bushels.

Plat No. 198, Finnish Black (No. 118-3).—A pure line started from a single head three years ago. A tall-growing oat on even moderately rich ground, it is a good sort to grow for hay. The kernels are long, slender, and brownish-black, with too much hull to be a first-class feed oat, but a very satisfactory sort to grow. Seeded May 14 on a 0.0595-acre plat, the crop was harvested August 25, yielding at the rate of 57.5 bushels per acre.

Plat No. 199, South Dakota (G. I. No. 637, Sta. No. 116-3).—A pure line, very similar to the above in appearance, but with heads somewhat smaller and kernels a trifle shorter, plumper, and blacker. Seeded the same date as Finnish Black, it ripened two days earlier. This is doubtless accounted for by the location of the plat, which, although adjoining the Finnish Black plat, was on somewhat higher and drier ground. The plat of 0.0263 acre yielded at the rate of 63.2 bushels per acre.

Plat No. 200, hybrid No. 35e-1-1 (hybrid No. 25a×South Dakota).—A promising sort with strong straw of good length and

panicked heads containing from 75 to 150 slender gray kernels with too much hull to be first class. Seeded May 15, this hybrid produced straw 48 inches in height and ripened August 23, yielding 58.96 bushels per acre.

Plat No. 201, Hansen (No. 240-3).—This was an exceptionally fine-looking plat of 0.18 acre. The straw of this oat is very coarse and stiff, reaching a height of 54 inches; the heads are panicked, large, and open, containing from 100 to 150 yellowish, fairly plump kernels. Each spikelet carries a large, stiff awn with a pronounced twist near the base. Seeded May 15, the crop was fully ripe when it was harvested September 13, yielding at the rate of 67 bushels per acre.

Plat No. 218, Hull-less (No. 304-3).—This plat comprised 0.25 acre, one end of which extended into new land where the oats was practically a failure, as were wheat and barley. This oat is awnless and hull-less. The panicked head bears multiflorous spikelets; the glumes are white; the kernels long and fairly plump. The grain was seeded May 18 and harvested September 15, when 90 per cent was ripe. The yield of grain was 194 pounds, or at the rate of 24.2 bushels per acre.

Plats Nos. 10, 64, 65, and 66; hybrid No. 25a (Copperfield×Toholampi).—This oat seeded May 21 showed ripe heads August 20, the bulk of the plats being ripe seven days later. It has a large panicked head with wide-spreading spikelets without awns and long slender kernels of a grayish-brown color. All of the plats were alike, producing no variations.

Plat No. 12, Victory (No. 330-2).—A white oat resembling Banner very closely in appearance and in late ripening. The heads are small, the straw is of medium height (42 inches) and good strength. Seeded May 21, about 50 per cent was ripe September 13.

Plats Nos. 33 to 36, Black Tartarian (No. 115-4).—A strong growing, black side oat, which, when first grown 4 years ago, barely ripened enough seed to continue the variety. By selection of the earliest heads every year, several days in point of earliness seem to have been gained. Seeded May 14 the plats were well ripened September 11, the straw being coarse and strong and about 54 inches in height, the heads 7 inches long with 75 to 110 kernels each.

Plats Nos. 37 to 47, 74 to 77, and 94 to 99; hybrid No. 36a (Black Tartarian×Yakutsk).—The pistillate parent is described above. The staminate parent is an early, white, panicked sort having short straw and small heads. The second generation split up in the manner expected, except that there were very few brown heads. There were many fine large heads to select from. The side type, both black and white, had the most kernels, running from 100 to 185 per head, the open, panicked type having from 75 to 110. The tallest in the series was panicked, white, and apparently stable, reaching a height of 60

inches and having small heads with 50 to 70 kernels. Others averaged 50 inches in height. Nearly all have coarse strong straw. The earliest heads were ripe August 31, from which date selections were made, until the plats were cut September 11.

Plats Nos. 48 to 53, hybrid No. 35e (hybrid No. 25a-3×South Dakota G. I. No. 637).—The crop on these 6 plats was identical in appearance. The hybrid is apparently stable and is a medium strong grower, having panicked heads with 75 to 110 kernels of a grayish-brown color. The glumes show a purplish bloom as the grain ripens. Seeded May 14, the grain was quite uniformly ripe August 31.

Plats Nos. 67 to 73, hybrid No. 35b.—This hybrid has the same parentage as No. 35e. Variations found in No. 35b were black panicle and gray panicle. No. 35b-1, a black-panicked form, has a decided purplish bloom on the glumes. Some fine heads were found having 175 kernels, also culms 54 inches long. Others were nearly as large. Seeded May 15, the first heads were ripe August 20. Although this hybrid possesses many admirable qualities, the kernel has too much hull for a first-class oat. This is characteristic of all hybrids having either Finnish Black or South Dakota for a parent. Unfortunately, all of the plumper-kerneled oats tried so far have been late maturing.

Plats Nos. 54 to 57, Banner (No. 267-2).—A pure line from which several selections have been made in the hope of isolating an earlier strain, but so far without success. It is a good variety except that it is late. It reaches a height of 47 inches and has white, panicked heads with short awns and quite plump kernels often numbering three to the spikelet. The seed was planted May 14 and harvested September 11.

Plats Nos. 58 to 63, Crown (No. 331-2).—A pure line to which the above description applies, as Crown and Banner are identical.

Plat No. 155, hybrid No. 51a (Hull-less No. 304-2×Norwegian No. 117-3).—From this cross four kernels resulted, two of which grew and proved to be true hybrids. Since the staminate parent is black (see under plats Nos. 190 and 218 for description of parents) and black is dominant, the two plants bore heads having black kernels. One plant had the usual triflorous spikelets of the staminate parent. The heads on the other plant were anomalies in that the spikelets displayed characters of both parents. The first heads were ripe August 25.

Plat No. 177, oat No. 365-1.—A first trial of seed originally from Tulun Experiment Station, Russia. A short-strawed, small-headed type resulted which is not a pure line, the average height being 36 inches, the length of heads 3 to 3.25 inches with 30 to 40 kernels per head. The plat was seeded May 21 and ripened August 29.

Plat No. 178, Polar (No. 372-1).—Also a first trial. Extravagant claims were made as to the hardness and productiveness of this oat,

but its first season here scarcely placed it in the mediocre class. Seeded May 21, it attained a height of 48 inches and ripened August 30, with heads from 4 to 5 inches long, each having 30 to 40 kernels. The kernels are very plump, the most desirable attribute of this type.

SPRING RYE.

Plats Nos. 100, 101, and 102; Irkutsk (No. 132-3).—These single-head-to-the-row plats were planted for the purpose of isolating an earlier strain that is not sterile. None of the plants measured up to requirements, plant No. 4 in plat No. 101 coming the nearest. It was 54 inches high and had large, well-filled heads, which were scarcely fully ripe, however, when cut September 13.

Plat No. 7, Mammoth (No. 125-4); plat No. 8, Gesselberg (No. 80-4).—Both of these plats were poorer than Irkutsk and practically worthless.

Plats Nos. 103 to 109, hybrid No. 34a (Mammoth \times Irkutsk).—Second generation. Among the several hundred plants in the seven rows, not a desirable head could be found. None was ripe when cut and all were more or less sterile.

BUCKWHEAT.

Plat No. 182, buckwheat No. 60-2.—This plat of 0.0128 acre was seeded May 21 and bloomed July 1. The past season seemed particularly well suited to the development of this cereal. The growth was not rank, but practically all of the grain ripened. Generally the first frost finds the plants with considerable bloom on the tips of the branches, but this year the plants had virtually bloomed out when harvested two weeks before the first frost, doubtless because the season was longer than usual. The yield of grain was 42 pounds, or at the rate of 68.3 bushels per acre.

Plat No. 184, Japanese buckwheat No. 71-2.—A yield at the rate of 81.3 bushels per acre was secured from a plat of 0.0121 acre. This variety has a pinker blossom than buckwheat No. 60-2 and is also more vigorous.

Seed of the above 2 plats is a pure line started from one selected plant of each variety 2 years ago.

HEMP.

Plat No. 179, hemp No. 307-2.—A small plat of 4 drill rows seeded May 21 began to bloom June 30 and was harvested September 14. The best plants were 40 inches tall, the poorest 12 inches. The plants fruited abundantly, about 75 per cent of the crop ripening.

MILLET.

Plat No. 180, millet No. 368-1.—A first trial. A plat of 6 drill rows was seeded May 21, the plants heading June 4 after making a

very slow growth, and attaining a height of 16 to 30 inches at the end of the season. No seed ripened.

FLAX.

Plat No. 181, flax No. 308-2.—A pure line started from a single plant 2 years ago. A small plat of 5 drill rows seeded May 21 began to produce purple blossoms June 3. The plants grew slowly, reaching a height of 28 inches, and the seed (brown in color) ripened slowly and unevenly, only about 40 per cent being ripe when harvested September 14.

APPLES.

For the second time a Siberian crab apple, now 11 years old, set fruit. Two years ago there were only two clusters of blossoms, neither of which set fruit. This year there were a dozen clusters of bloom on two of the three surviving trees. Of all the blossoms, only two set fruit. This cluster of two remained until picked, September 5. They were 1 inch in diameter and had begun to ripen.

POTATOES.

Due to the late spring, the piece of land reserved for potatoes was very slow in drying off, consequently it was rather late for best results when planting could be done (May 22 and 23). Even then the plow, in laying off the land, scraped frost in several places. Altogether 0.5 acre was planted, mainly to Irish Cobbler, Burpee's Superior, and Gold Coin. The seed was thoroughly sprouted before planting. In spite of the long season, there was scarcely half a crop, due, it is thought, in part to the late start, but chiefly to the infertility of the soil. So far as can be judged from experiments here, this bench land will not produce a satisfactory potato crop unless the ground is well manured.

In sharp contrast to the potatoes in the field, were seven varieties planted in good garden soil about May 16 from well-sprouted seed pieces. They began coming up May 27, were blooming July 4, and were harvested September 20, at which time the vines were still partly green. The yield of these seven varieties was as follows:

Yield of seven varieties of potatoes grown in garden soil.

Variety.	Number of hills planted.	Total yield.	Average yield per hill.
		<i>Pounds.</i>	<i>Pounds.</i>
Irish Cobbler.....	50	165	3.3
Burpee's Superior.....	50	205	4.1
Late Puritan.....	50	182	3.6
Early Six Weeks.....	50	170	3.4
Gold Coin.....	50	164	3.3
Knowles's Big Cropper.....	50	190	3.8
Netted Gem.....	25	80	3.2

In point of mealiness, Irish Cobbler leads, with Early Six Weeks, Netted Gem, and Gold Coin close seconds, there being very little difference, if any, between these three. Burpee's Superior, Lake Puritan, and Knowles's Big Cropper take third place. (Pl. III, fig. 2.)

STRAWBERRIES.

A plat was started during the summer of 1913 with a number of Sitka hybrids. The first two winters evidently eliminated the weak plants, as practically none of the plants froze out during the third winter, and last year all came through in first-class shape, even a new plat of No. 275 set out during May, 1916. All showed good vigor and runnered freely. The first blooms appeared June 2, and a quart of ripe fruit was picked July 23. From then until September 4, fruit ripened freely. The final picking was much enjoyed by a score of travelers on their way outside on the steamer Yukon. These hybrids certainly deserve to be ranked among the valuable plant creations of the last few years. Sufficient proof of their worth lies in the fact that they were produced and grown at Sitka where the temperature seldom reaches zero; that they have survived winter temperatures here of -66° F. without protection other than the snow; and finally, that they fruited abundantly here for a period of six weeks, producing large, luscious berries (Pl. I, fig. 2). Already a number of applications are on file in this office for plants next spring. Doubtless during the next few years their culture will be widely extended.

THE GARDEN.

The usual plat of ground, 75 by 90 feet, was seeded to vegetables. Every fall this plat is given a dressing of rotted stable manure and wood ashes and is then plowed from 8 to 10 inches deep. In the spring, as soon as the ground is dry enough to crumble, it is thoroughly harrowed. It is important that the first harrowing be done at just the right time, as too wet a surface becomes harsh on drying so that the horses' feet compact the earth, and too dry a surface breaks up into hard clods. Harrowed at the right time, the surface crumbles under the harrow teeth like a piece of slaked lime. This year a part of the garden was harrowed May 10 and the remainder a few days later. The first seeding was done May 14.

Salad plants.—The following varieties of lettuce were grown: Delicious, Salamander, Hanson, Henderson, Grand Rapids, Prize Head, Hubbard's Market, Paris White Cos, and Lilly's Forcing. Of these Prize Head was the first large enough for use, attaining edible size on June 17. Hubbard's Market was the first to run to seed. Hanson gave the best results, having medium solid heads, curly leaves, and excellent flavor. Paris White Cos does not do so well here as

Trianon Cos. Corn salad did fairly well; endive ran to seed at once and was worthless.

Swiss chard.—Lucullus as usual did well. It makes splendid greens, both leaves and stalks, the latter being excellent for winter consumption when canned.

Carrots.—Danvers Half Long, James's Intermediate, and Chantenay all did well. This sandy loam is excellently suited to carrots, many of which were 10 and 12 inches in circumference.

Beets.—Extra Early Egyptian and Crimson Globe did equally well.

Peas.—Alaska, Horsford's Market Garden, Gradus, and Nott's Excelsior are all standard sorts and need not be described. For earliness Alaska (station-grown seed) leads, July 3, while Alaska (department seed) was not ready for table use until two weeks later. Gradus and Nott's Excelsior were ready July 7, while Horsford's Market Garden was not ready until July 20, but it is very prolific and has a good flavor.

Tomatoes.—In the garden tomatoes did not do so well as they did last year, as the summer was too cool. Practically only those blossoms that had set at the time of transplanting produced fruit. Other blossoms blighted. Nevertheless, several tomatoes ripened fully of the varieties Spark's Earliana, Ponderosa, May's First of All, My Maryland, and Livingston.

In the propagating house the same varieties of tomatoes were grown as in the garden. All kinds produced fruit, but Spark's Earliana and Ponderosa bore most abundantly and had the finest flavored fruit. My Maryland was the poorest cropper.

Beans.—Red Valentine and Extra Early Refugee did fairly well this year. Bush Limas failed, as very few plants came up and none set fruit.

Cabbage.—Early Jersey Wakefield and Dwarf Flat Dutch were set in the garden May 26. All produced heads, many of which weighed 12 pounds, the largest 17 pounds. The Flat Dutch, though not so early as Wakefield, produces larger heads and is milder flavored.

Cauliflower.—Dwarf Erfurt (seed 11 years old) and Early London were transplanted to the garden May 26. As usual Erfurt made small, early heads, the first being cut July 6. Early London began heading August 25. Some of the heads were mere buttons when caught by the fall freeze. Early Snowball grown last year is a better variety.

Parsnips.—Station seed of the variety Hollow Crown was fall sown, producing very uneven growth with roots small, medium sized, and in a number of cases quite large. Some roots left in the ground

a year ago sent up seed stalks and ripened about 10 per cent of the seed. Roots spring planted did likewise.

Rhubarb.—Victoria plants 11 years old and Mammoth Red 3 years old produced an abundance of succulent stalks. The plants are not artificially protected during the winter. Every spring a forkful of well-rotted manure is worked in around each plant. It is not necessary to cook rhubarb for canning. Simply wash the stalks thoroughly, cut into about inch lengths, pack the jars, then fill to overflowing with cold water, seal air tight, and keep in a cool dark place in the cellar. Rhubarb canned in this manner can not be told from the fresh when cooked.

Celery.—White Plume was grown in a cold frame, doing exceedingly well. Every plant produced a fine bunch of tender, crisp stalks 2 feet high.

Cucumbers.—These were again grown in a hotbed, and, though producing considerable fruit, did not do so well as last year because of the different weather conditions.

Summer squash and Japanese squash.—These vegetables, also in the hotbed, made tremendous growth. Most of the summer squash rotted before it was large enough to use, probably because of the lack of sunshine and the excessive rainfall. The Japanese squash did not produce fruit of edible size.

FLOWERS.

A thousand plants of flowering annuals were transplanted to the house yard during the latter part of May. In addition to these the seed of such annuals as poppies, larkspur, mignonette, candytuft, and sweet alyssum was sown in the beds. All told, about 70 varieties were grown. Among the annuals tried here for the first time schizanthus, godetias, African daisies, and colored chrysanthemums are worthy of praise. All are hardy and continual bloomers. The cup-and-saucer vine, also grown for the first time, proved to be very hardy and a rapid climber. A large bed of double poppies, in a riot of color, produced some of the handsomest flowers ever grown here, many of the individual blooms being 5 inches in diameter and an occasional one 6 inches.

REPORT OF WORK AT FAIRBANKS STATION.

By M. D. SNODGRASS, *Assistant in Charge*.

The work at the Fairbanks Station has been continued the past year according to the program outlined in former reports, with the exception that a part of the land was not summer fallowed. Every foot of the cultivated land was seeded last spring. Approximately 100 acres of land was cropped this year, 95 acres in small grains and

5 acres in root crops. South slope fields were all utilized in seed growing, while north slope fields were mostly devoted to raising grain hay.

Spring work in the fields began May 3, just one week after the snow left the south slopes. Freezing of the ground continued for five nights, after which general field work was on in full force. Five men and 13 horses were employed in the field work from May 11 to May 28, when field seeding was finished.

Pedigree grains were seeded May 11 and 12, and increase plats May 13 to 16, while general field seeding began May 13 and was continued as rapidly as the ground could be put in fit condition. Potatoes were planted May 27 to June 1.

Improvement work was continued only in a small way. The barnyard fence was rebuilt, field fences repaired, and a small hog pasture was prepared after the seeding and planting was over. A third room was built as an addition to the assistant's cottage during July, and after harvesting and the fall plowing was done an acre of stump land within the hog pasture was cleared and plowed. Sufficient wood for fuel, amounting to about 75 cords, has been taken from uncleared lands during the winter. A log office building, 16 feet wide and 24 feet long, has been erected and partially finished since the freezing weather set in. It will be made into two rooms when funds are available, one for office work and the other for storing records, bulletins, and other books. Heretofore the four-room cottage has had to serve as office, boarding house for workmen, and home for the assistant in charge and his family at one and the same time.

All fields, amounting to 100 acres in area, were fall-plowed after the crops were harvested and are now in shape to hold much of the snow water as it melts. The dry weather during the fall months left the ground loose and cloddy after plowing, in which condition it was caught at the freeze up. The fall plowing makes it possible to get the spring seeding done as soon as the ground dries out sufficiently to work with disk and harrow.

With the exception of 5 acres of wheat, all grain was thrashed during the fall and early winter. Some 10 acres of the earliest grain was thrashed from the shock, about 45 acres stacked in the fields, and 5 acres stored in the hay shed. Thrashing from the stack and shed was done after snowfall, just one month after stacking. Some of the stacks were found to be in the sweat at this time and thrashing was difficult. Stack burning occurred in three instances in Black Finnish oats where the stacks were large and the grain was the least bit damp when stacked. To avoid stack burning or heating it is recommended that small stacks only be built. Freezing weather comes suddenly and remains, so that small stacks will freeze dry in a short time. A

new Mogul 8-16 horsepower tractor and a two-bottom 14-inch gang plow were received by this station October 18, also a new 21-inch cylinder thrashing machine mounted on steel trucks (Pl. V, fig. 1). This machinery came too late to be used in the field for plowing, but was used for all late thrashing. The old thrashing machine and tread power were shipped to the Rampart Station on the last boat before navigation closed, after the new machinery had been landed in the country. This new machinery was expected by August 1, but was six weeks longer than usual on the way. This incident is given only as an example of the transportation service into the interior of Alaska. The settler needs to get all machinery into the country the season before he has use for it, or he will be delayed in his operations. However, this feature is being overcome, as some of the merchants are beginning to put in a stock of the more simple farming implements.

CLIMATIC AND GENERAL CROP CONDITIONS.

Climatic conditions still hold the chief place when the agricultural possibilities of this country are under consideration.

A short summary of climatic conditions in the Fairbanks district for the past seven years is given below. The time covered is not sufficient to base conclusions upon, but the available data tend to give an idea of general conditions under which farming in the Tanana Valley is done.

Temperature and precipitation, the two most vital factors from the farmer's standpoint, aside from soil, have been here arranged in a condensed table showing monthly precipitation and mean temperature, also the length of the season between frosts.

Condensed climatology of Fairbanks, Alaska.

Month.	1911		1912		1913		1914	
	Precipitation.	Mean temperature.	Precipitation.	Mean temperature.	Precipitation.	Mean temperature.	Precipitation.	Mean temperature.
	<i>Inches.</i>	<i>° F.</i>	<i>Inches.</i>	<i>° F.</i>	<i>Inches.</i>	<i>° F.</i>	<i>Inches.</i>	<i>° F.</i>
January.....	0.10	-23.8	0.10	-4.0	0.43	-23.8	0.32	-9.4
February.....	.04	2.0	.10	9.5	.35	3.9	.38	6.4
March.....	.04	2.5	.95	23.8	.85	11.6	1.06	9.0
April.....		17.4		38.2	Trace.	29.2	.66	25.6
May.....	.16	42.8	1.22	51.6	.47	46.8	.59	45.2
June.....		57.2	3.25	53.9	.44	68.3	1.51	60.4
July.....	2.16	64.1	.96	60.9	2.25	63.8	4.63	53.6
August.....	2.30	56.6	.82	55.1	3.70	52.0	2.06	54.1
September.....	1.60	45.4	1.16	45.4	.51	41.2	1.36	39.6
October.....	.22	35.3	.54	26.8	1.00	20.2	Trace.	32.7
November.....	.29	-2.8	.24	2.0	.26	-4.7	.31	6.8
December.....	1.23	-5.7	.97	-9.2	.15	-3.5	1.52	9.5
Total precipitation.....	8.14	.....	10.31	.....	10.41	.....	14.40	.....
Number of days between frosts.....	98		114		97		85	

Condensed climatology of Fairbanks, Alaska—Continued.

Month.	1915		1916		1917		Mean temperature, 7 years.
	Precipitation.	Mean temperature.	Precipitation.	Mean temperature.	Precipitation.	Mean temperature.	
	<i>Inches.</i>	<i>° F.</i>	<i>Inches.</i>	<i>° F.</i>	<i>Inches.</i>	<i>° F.</i>	<i>° F.</i>
January.....	0.12	— 5.0	2.22	— 7.6	0.41	—19.7	—13.3
February.....	1.06	— 7.4	.48	— 3.4	.42	9.1	2.9
March.....	1.60	17.3	.04	2.2	.20	16.7	11.9
April.....	.26	37.2	.28	36.5	.24	32.8	31.0
May.....	Trace.	51.4	.95	46.1	.35	45.6	47.1
June.....	1.80	61.8	2.16	59.3	1.09	57.7	59.8
July.....	1.67	65.3	2.31	60.4	4.11	55.9	60.6
August.....	3.24	56.8	2.72	56.3	1.48	58.2	55.6
September.....	3.12	45.7	1.42	44.9	.28	44.6	43.8
October.....	.64	18.8	1.89	30.1	.64	24.6	26.9
November.....	.63	3.0	.53	4.0	.40	—10.2	— .3
December.....	.44	— 7.4	.71	—14.4	.22	—33.2	— 9.1
Total precipitation.....	14.58	.....	15.71	.....	9.84	.....	.....
Number of days between frosts.....	110		103		118		

The lowest and the highest temperatures of this district during this period of 7 years were -62° and 95° F., respectively. Such extremes were recorded only once, but -40° is fairly common during the months of December and January, while 85° is often recorded during the months of June and July. The average annual precipitation for the period was 11.9 inches, the total precipitation falling as low as 8.14 inches in 1911 and reaching 15.71 inches in 1916. The average snowfall for the 7 years was 32.4 inches, an estimate based on the measured precipitation from the melted snow, allowing 10 inches of snow to 1 inch of water. The snow is seldom as much as 3 feet or less than 2 feet in depth. There is little drifting in the valley lands in this district, but the converse is true in the hills.

A comparison of the annual precipitation and the snowfall shows that an average of 8.5 inches of rainfall is available for the growing season, the greater portion falling during June, July, and August. The rainfall for May averages only 0.53 of an inch. The average rainfall for June has been 1.7 inches, July 2.6 inches, and August 2.3 inches, dropping to 1.35 inches for September. The rainfall for September evaporates little, but is stored in the ground for the following season if the ground is in condition to receive it, because of the freeze-up which soon follows. The spring thaw occurs from April 10 to May 1, during which time much of the snow water runs off the land as fast as the snow melts, especially on the hillside fields. Only the fall-plowed land is in condition to hold much of the snow water, and the amount held depends upon whether the ground was dry or saturated at the time of freezing the previous fall.

The snow was gone from the south slopes April 26, allowing field work to begin a week later, but the continued dry weather caused

poor germination in a number of field plats. Rains in June and July caused the germination of additional seed, thereby causing uneven growth in much of the grain. This was especially noticeable when the grain began heading, particularly when the earlier heads began ripening. Excessive rainfall during July considerably lowered the mean temperature for that month, but as this was followed by favorable weather during August, grain matured fairly well. The effects of the early drought could not be overcome and grain yields were about half normal. Frost held off later than usual, allowing 118 days between the last frost in the spring and the first frost in the fall, which occurred September 15. September was dry, giving favorable weather to care for the grain crops and to do fall plowing. October weather was about normal in temperature and snowfall. The freeze-up came October 15 to 18, when field work was suspended. November was severely cold, the mean temperature falling 10° below normal, followed by the coldest December within the knowledge of old-timers, the mean temperature for December being -33° . This is 24° colder than the 7-year average and 43° below the mean temperature for December, 1914.

WINTER GRAIN.

Winter grains nearly all winterkilled the past season. Kharkov wheat and two varieties of winter rye tried this year all froze. A few plants of winter rye seeded in a small plat with a windbreak to hold the snow survived and produced a little seed, which ripened just before the frost came on September 15. About an acre of rye, S. P. I. No. 19556, seeded August 14 on level bottom land, was about 2 inches high on September 17, had a good color, and made a perfect stand. This went into the winter in perfect condition and is now covered with a foot of snow.

SPRING GRAIN.

Spring seeding was begun May 11 and continued until May 27, 61 acres being seeded for grain production and 34 for grain hay. The dry spell of May and the first half of June caused the production of a grain crop about half normal. The straw growth was short and much of it uneven owing to the uneven germination of the seed and the sending up of late culms after the wet weather set in.

Three varieties of spring wheat, 2 of oats, and 2 of barley were grown under field conditions. Over 1,240 bushels of grain was thrashed. Some 60 bushels of wheat remain in stack. Only one variety of hull-less barley tried under field conditions failed to mature, and that because it was seeded too late on bottom land. Cut with the binder after the first frost and cured in the shock, it made excellent hay. Three varieties of oats were grown in small increase plats, also 3 varieties of barley; while 6 varieties of wheat, 14 of

barley, 6 of oats, and 1 of rye were grown in head-to-row tests. Most of these grains are from pedigree strains from Rampart Station where the varieties originated. The performance of each variety was carefully noted and data were kept showing any special adaptability to conditions obtaining here. Head selections were made from all promising varieties for future experimentation. Care was exercised in the head selection work to take seed from plants having desirable characteristics, such as stiffness of straw, large number of culms, well shaped and well-filled heads, early maturity, and conformity to type. All selections were made secure, labeled, stored in the grain shed, and later thrashed, weighed, and compared with other grain of the same variety. All data were recorded for future reference. A second selection was made from the more desirable head rows for increase plats next season. The total grain yield of all head rows has been recorded.

Barley.—Hull-less barley, S. P. I. No. 19851, seeded May 14, germinated poorly, and was reseeded June 10, from which seeding a good stand was secured. It grew rapidly, headed out fully July 25, and was 25 per cent ripe September 15, when cut for hay. Another field on bottom land seeded to this same variety May 31 germinated poorly and was affected by the early drought. Good-sized and well-filled heads grew on the thin stand, but all failed to ripen. This was cut with the binder and cured for hay in the shock.

Beardless barley, S. P. I. No. 19852, was seeded May 18 and 19 on a north slope field which had been under cultivation for 8 years cropped alternately with summer fallowing. This made a fair growth, though the stand was poor, which allowed uneven ripening. The heads were of good size and well filled, while the straw was weak and lodged in some places. This field was harvested with the binder September 4, stood in shock four weeks, and was then stacked. Sixty-nine bushels of barley was thrashed from 8 acres.

Oats.—The main crop grown this season was the variety Finnish Black, of which 21 acres was seeded May 22 and 24, on a nearly level field lying at the foot of a south slope. This field was cleared and put under cultivation during the season of 1912 and 1913. Part of it was cropped with oats in 1914, and all in oats in 1915, followed by summer fallow in 1916. The growth was uneven during the early growing season, owing to uneven germination and dry weather.

The grain ripened very unevenly, and was harvested September 5. There were many late heads throughout the field, most of which came from culms that grew after the July rains set in and yielded a considerable amount of light kernels that blew over with the chaff in thrashing. From the 21 acres, 665 bushels of oats were thrashed, making a yield of 31 bushels per acre. The grain stood in shock for four weeks. It was then stacked and later thrashed from the stack.

Canadian oats from seed grown at this station for 3 years was again tried, with fair success. One acre was seeded May 17 on the north slope field, which had been cropped with potatoes for 3 years. A perfect stand resulted, and the grain made even and vigorous growth, heading July 10 and beginning to ripen August 15 at a height of 40 inches. On September 1 the grain was harvested with binder and was shocked. (Pl. V, fig. 2.) After standing in shock for 12 days it was stored on poles in the grain shed to insure drying. From this acre field 54 bushels of oats was thrashed. The kernels are white, heavy, and very plump.

From one-third acre of a south slope field which had been cropped continuously in grain for 5 years and was seeded to Canadian oats May 14, a yield of 25 bushels was thrashed. These oats were ripe August 26, 104 days after seeding. From the 4-year test given this variety it bids fair to become a valuable oat for this region. A considerable acreage will be seeded the coming season.

A third-acre plat of South Dakota oats seeded alongside the Canadian oats on the same day under the same conditions thrashed out 19 bushels. This oat was not so plump as the Canadian, but it matured in the same length of time and gave a very fair yield. It is inclined to shatter more than is desirable. This same fault is to be found with the Finnish Black variety, while it is scarcely apparent in the Canadian.

Small increase plats of New Swedish and Hansen oats seeded alongside the above varieties on the same date matured 6 days later. Neither variety made a good stand, and both gave only light yields of fair oats.

All of these varieties will be given another yield test next season; also a comparison will be made with the more promising oats grown in the head-to-row test.

Spring wheat.—Of the three varieties of spring wheat grown at this station the past season the Russian variety designated as H. G. leads in adaptability to the climatic and soil conditions of this region. In point of yield it is behind both the Romanow and Marquis varieties, but as a surer crop it must be given preference. This variety was grown in four different fields representing land in every stage from second-year to ninth-year cultivation and cropping and of every sort found on the reservation, as south hillside, north hillside, and flat bottom land, and under every condition it has given favorable returns. All the early seedlings matured in 99 days, several days earlier than the other varieties, thereby allowing thrashing from the shock, as it was perfectly mature and dry enough to thrash from the shock just 118 days from seeding. The straw was short, standing from 24 to 28 inches high, with short, well-filled heads and

small, angular, yet fairly plump kernels. Yields of 10 bushels per acre were obtained on south hillside land under cultivation and continuous cropping to grain alternating with potatoes for 6 years. The same yield was obtained on a north slope field under cultivation 9 years with grain alternating with summer fallow. A yield of $12\frac{1}{4}$ bushels per acre was obtained on bottom land cropped in oats two alternate years with summer fallow, 14.7 bushels per acre on south hillside field 4 years under cultivation and continuously cropped in oats, and $15\frac{1}{3}$ bushels per acre on south hillside field as second crop following oats. The general average yield of this variety was above 12 bushels per acre for this season, during which a total of 256 bushels was grown. This is the fourth season that H. G. wheat has been grown here. A few ounces of seed was received in 1914 from the experiment station in the Province of Irkutsk, Siberia. A baking test of whole-wheat flour from this wheat was made by the Fairbanks Bakery and the bread was pronounced excellent. The bakery asked for all the wheat the station could spare, but were informed that this wheat was for seed purposes only. It is planned to seed all of this except enough for another year's seeding in case this year's crop fails. The larger portion of this wheat will be sown by farmers in the Tanana Valley. A special price of 3 cents a pound for seed in 100-pound lots or less has been made to the farmers to induce as many as will to grow this wheat. The orders are coming in fast and the supply will be all taken.

Romanow spring wheat gave very fair returns this season when the early drought is taken into consideration. This variety grows well here on south hillside fields under ordinary conditions. It produces a ranker growth than H. G. wheat, having large, plump kernels in long, well-filled heads. From $1\frac{1}{2}$ acres of south hillside land, which had been under cultivation 4 years with potatoes as the crop in 1914 and grain in 1915 and 1916 and was seeded May 13 to Romanow wheat, a yield of 17.9 bushels per acre was obtained. The grain in this field was noticeably retarded in growth by the drought. The straw was short, and in some spots the heads were shorter than usual but all were well filled with large, plump kernels. The grain matured August 26, taking 105 days from seeding to maturity. It was harvested and shocked on this date and was thrashed from the shock September 18. Four and one-half acres on a north gently sloping field, under cultivation 9 years and during that time cropped in grains alternating with fallow, was seeded to Romanow wheat May 17. It made a fair growth both in straw and heads, but gave rather a poor stand. It was ripe enough to harvest September 3, although it contained a considerable number of green heads. It was harvested, shocked, and allowed to stand three weeks in the shock, then stacked



FIG. 1.—NEW TRACTOR AND THRASHING MACHINE THRASHING GRAIN FROM STACK, FAIRBANKS STATION.



FIG. 2.—CANADIAN OATS IN SHOCK, FAIRBANKS STATION.



FIG. 1.—RED CLOVER AS AN ANNUAL CROP, FAIRBANKS STATION; SEEDED MAY 12, CUT OR PLOWED UNDER SEPTEMBER 7, 1917.



FIG. 2.—DIGGING POTATOES AT FAIRBANKS STATION.

in order to clear the field for fall plowing. Four weeks later it was thrashed, giving a yield of 11.5 bushels per acre. There was a considerable amount of shrunken kernels in the thrashed grain, and some went into the straw. Germination tests show only 50 per cent mature. Tests made of this variety in previous seasons and during this year show that Romanow wheat is a little late in maturing for general use in this country. On suitable south hillside fields that can be seeded by May 15 Romanow can be depended upon. It is usually a heavy yielder and is worthy of further experimentation.

Marquis spring wheat, a smooth variety grown here for the third season, is another sort adapted to south hillside fields where early seeding is possible but not to be relied upon for general seeding. One acre of south hillside land beside the plat of Romanow mentioned above was seeded on the same date to Marquis wheat. This suffered from the drought, giving short straw and short heads, which however, were well filled with plump kernels. The grain was ripe enough to harvest September 1, thus requiring 110 days to mature. It was then cut and shocked and left to stand in the field two weeks, then stored in the grain shed on poles to insure thorough drying. From this acre a yield of 14.8 bushels was thrashed.

All three varieties of wheat mentioned above gave yields in 1916 of 36 to 40 bushels per acre, about the average yield obtained in former years. The early spring drought cut the yield fully half for all grain crops the past season.

Buckwheat.—Japanese buckwheat of the sixth generation of station seed was again grown successfully this season. One acre of south hillside land, upon which two crops of oats were previously grown in consecutive seasons, was seeded to Japanese buckwheat on May 20, a fair stand was obtained which began blossoming June 26, and the seed, which set early, was ripe August 10. A fair setting of seed was obtained, enough of which was mature to warrant harvesting August 24. It was shocked in long narrow shocks and left to dry four weeks, then stored on poles in the grain shed for further drying. Considerable shattering was occasioned by the binder reel striking the ripe grain, and again in handling and storing. Twelve bushels of choice buckwheat was thrashed from this field.

LEGUMES.

Field peas.—Three varieties of field peas were tried this season with only fair success. Small plats were seeded May 22 by the hand drill on a south slope field. Few pods matured, but the heavy yield of vines and well-filled pods produced was cut for hay September 17. The vines, stacked over a pole rack, froze dry, retaining their green color and making excellent hay for hog feed. Selections of the earli-

est pods were made for next year's seeding. The following varieties were grown:

Kaiser (S. P. I. No. 1423), seeded May 22. The first blossoms appeared July 6, many well-filled pods by August 15. The vine growth was very heavy, and a heavy yield of peas was indicated, but only a few pods matured before the frost came on September 15.

Golden Vine (S. P. I. No. 16130), seeded May 22, blossomed first on July 20 and had many well-filled pods August 15, only a few of which matured by September 15. A very heavy vine growth was produced, making a heavy yield of hay.

Amraoti, seeded May 22, had its first blossoms July 15. Pods were well filled August 15, but few were ripe September 15. The vine growth was heavy.

The heavy growth obtained here makes field peas a very desirable crop if only an early variety can be found that will mature seed in this region.

Alfalfa.—North Swedish, seeded in 1915, made fair growth during the spring, practically all plants having come through the winter without damage. It began flowering July 6, setting considerable seed, very little of which matured. A growth of 20 to 30 inches was made during the whole season.

Cherno, seeded in 1915, came through the winter in fair condition and made a good growth during the spring. It began flowering July 11, setting a few seed, but few ripened. The growth was upright and from 24 to 30 inches high.

Cossack, seeded in 1915, came through the winter without damage, but made only a fair growth during the early spring. It began flowering July 10, setting a few seed, scarcely any maturing. The growth was fairly upright and from 20 to 24 inches high.

Semipalatinsk, seeded in 1915, came through the winter without damage and made fair growth during the spring. It began flowering July 6, setting many seed but maturing only a few. The growth was rather spreading and about 20 inches high.

New seedlings this spring on the higher land failed to make the usual rapid growth obtained with alfalfa during former seasons. The early drought retarded the growth noticeably, but the summer growth was fair. Some seed of each variety was treated with a proprietary culture of nitrogen-fixing bacteria.

Clover.—Red clover seeded for soil improvement this season made vigorous growth, clearly showing that the soil is well adapted to growing clover. The fact that red clover winterkills is the only drawback to its culture known.

One-third acre lying directly in front of the station cottage was seeded to red clover on May 12, with the grain drill closed tight and set deep because of the dry soil. This seeding resulted in a heavy

stand which, however, was irregular because some of the seeds did not germinate until July rains came. The early plants were flowering July 15. By August 20 the ground was densely covered with a luxuriant growth 20 to 24 inches high and in full bloom. The clover was left standing until September 7, at which time it was 24 to 30 inches high. The clover on two strips through the plat was cut and hauled off the ground for hay, and the remainder was plowed under for green manure (Pl. VI, fig. 1). That portion of the plat from which the clover hay was removed was staked off for making observations on the growth of next year's grain crop.

Another plat of red clover was seeded higher on the hillside May 13, on ground too dry for germination of the seed until after the July rains set in. Turnips and considerable volunteer grain came in this plat, which produced less than a half stand of clover. Very uneven growth of the clover resulted, and little benefit was derived from this seeding. It was plowed under early in the fall.

White clover, seeded in 1916 in the lawn, wintered in fair shape and made a fair growth this season under unfavorable moisture and soil conditions.

HAY CROP.

The hay crop consisted of grain hay, the second crop in importance in this region. Some 30 acres of oats seeded on north hillside land May 26 and 27 resulted generally in a fair stand. The growth was not so badly affected by drought as on south slopes. The oats were cut August 17 and 19, just as they were entering the dough stage. Unusually favorable weather prevailed during the last 10 days of August, following light showers on August 20 and 21. The hay cured quickly after these showers. All hay was in the shock by August 25, and all was stacked or in the barn August 28. The practice of stacking green oats on pole racks was again successfully tried (Pl. VII, fig. 2). This method allows the stacking of oats when half cured and enables the farmer to save his grain hay between showers. The hay cured in this way retains its green color and best qualities. Another favorable feature of this practice is the clearing of the fields for early fall plowing.

The yield of oat hay averaged about $1\frac{1}{2}$ tons per acre this season. The hay crop of this region is principally grain hay, as there is little native grass growing in the Tanana Valley. Tributary valleys contain areas of native bluetop (*Calamagrostis langsдорfi*) large enough to cut with machinery, but for the most part the native hay must be cut with scythe and raked by hand. The price of hay at Fairbanks this year is \$110 per ton for double compressed timothy hay, from \$60 to \$90 for oat hay grown here, and \$30 to \$40 for native hay. The average yield of oat hay was slightly over 1 ton per acre on old land, nearly 2 tons per acre on new land, and about 1.5 tons per acre on

potato land. Land kept in grain hay year after year will soon lose its productiveness.

POTATOES.

The potato still holds its place as the money crop in this region. The returns from the potato crop must carry the farmer through the season, that is, must pay the necessary household expenses. The gardens furnish an abundant supply of many kinds of vegetables, but the demand for these is limited, as market gardeners usually supply the trade, and the farmer can not depend upon the sale of his vegetables.

The potato crop was below the average in yield per acre, but the acreage in this vicinity was larger than usual. The quality of the potatoes grown this season was unusually good, many of them being quite mature and cooking dry and mealy. The potatoes grown on the hillside farms were practically all of excellent quality. The yields on valley lands were a third heavier than on hillside lands, where the average for the whole district was a little above 3 tons per acre.

The price of potatoes at digging time this season was \$90 per ton in bulk and 6 cents per pound in small lots. This is the usual midwinter price.

The potato crop at this station consisted of 5 varieties grown in field plats, 8 in yield test plats, 29 in small amounts to determine their adaptability to climatic and soil conditions. All the potatoes were planted May 26 and 27 except the smaller lots, which were planted June 1. The seed was dipped in formaldehyde solution before planting, and all planting was done on land which had been in grain crops the previous year, thereby avoiding possible lurking potato diseases. The wet weather in July made it impossible to give the potato fields the proper cultivation and caused the ground to pack too much for best growth. However, the vine growth was generally very fair and thrifty. Owing to the lack of cultivation, the ground dried out so much that the crop actually suffered from drought late in August. An average of four to five tubers was produced per hill and these made only fair growth. (Pl. VI, fig. 2.) About 80 per cent of the tubers were of marketable size and 20 per cent culls. The following tables give data regarding yields from increase plats, variety tests, and single-row tests:

Potato yields.

INCREASE PLATS.

Variety.	Stand.	Character of vine growth.	Tubers affected by blight.	Size of plat.	Total yield.	Yield per acre.	Marketable tubers.	Rank as determined by cooking qualities.
	<i>Per ct.</i>		<i>Per ct.</i>	<i>Acre.</i>	<i>Pounds.</i>	<i>Bushels.</i>	<i>Per ct.</i>	
Gold Coin.....	95	Heavy.....		0.348	3,339	160	61	First.
Burpee's Superior.....	95	Medium.....		.595	6,480	108	75	Second.
Extra Early Ohio.....	95	.....do.....		.294	2,211	131	80	Ninth.
Extra Early Pioneer.....	95	Medium.....		.440	3,267	123	76	Seventh.
Vornehm.....	95	heavy. Medium.....	2	.280	2,140	127	56	Tenth.

Potato yields—Continued.

VARIETY TESTS.

Variety.	Stand.	Character of vine growth.	Tubers affected by blight.	Size of plat.	Total yield.	Yield per acre.	Market-able tubers.	Rank as determined by cooking qualities.
	<i>Per ct.</i>		<i>Per ct.</i>	<i>Acre.</i>	<i>Pounds.</i>	<i>Bushels.</i>	<i>Per ct.</i>	
Early Ohio.....	95	Fair.....	30	0.071	529	123.5	72	Twelfth.
Gold Coin.....	95	Heavy.....	.....	.065	633	162	64	First.
Eureka.....	95	Medium.....	5	.067	612	152.2	73	Eighth.
Beauty of Hebron.....	95	do.....	20	.062	491	129.3	71	Thrd.
Alaska Beauty.....	95	Small.....	30	.056	310	92.2	68	Sixth.
Ohio Junior.....	95	do.....	5	.052	431	138	83	Eleventh.
Irish Cobbler.....	95	Medium.....	2	.047	420	148.9	81	Fourth.
Early Market.....	95	do.....	5	.175	1,647	156	80	Fifth.

Yields of potatoes from single-row test.

Variety.	Stand.	Character of vine growth.	Tubers affected by blight.	Length of row.	Total yield.	Market-able tubers.
	<i>Per cent.</i>		<i>Per cent.</i>	<i>Feet.</i>	<i>Pounds.</i>	<i>Per cent.</i>
Carman No. 1.....	95	Medium.....	5	155	126	66
Million Dollar.....	95	Medium heavy.....	2	155	182	92
Early Six Weeks.....	95	Heavy.....	.....	155	175	91
Dakota Red.....	95	Medium heavy.....	.....	155	110	73
Noroton Beauty.....	95	Medium.....	5	155	111	83
Bliss's Triumph.....	95	do.....	2	155	82	73

Potato blight was noticeable in many places over the test plats late in the season. Appearing here and there in spots, it seemed to spread in all directions. Some varieties showed very little effect of the disease, even when growing beside the worst spots. The increase plats were nearly free from the blight. Very little scab was to be found on the potatoes grown at the station this year. By careful treatment and continual changing of fields it is hoped that potatoes free from these diseases may be grown here. Reports from the surrounding country show that both blight and scab were present to some extent.

The following varieties were grown in small lots to determine their adaptability to conditions here: Epicure, Rural New Yorker, Knowles's Big Cropper, Noroton Beauty (Rampart seed), Burpee's Superior (new seed), Irish Cobbler (Rampart seed), First Early, Burpee's Extra Early, Pride of the South, Bovee, Good Times, Admiral Dewey, Uncle Gideon's Quick Lunch, May King, Early Surprise, Hundred Fold, Pride of Multnomah, Earliest of All, American Wonder, Prize Taker, Netted Gem, and three unnamed varieties. Among the above varieties there were a few giving promise of fair yields that will be planted again next season. Most of them, however, made such a poor showing this season that they will be discarded.

TURNIPS.

The Petrowski turnip is another sure crop in this region. The dry weather in June gave the turnip crop a set back, making it necessary

to reseed July 7. These were not thinned and failed to make a crop. Several tons, however, were gathered from a volunteer crop in the clover plat and from one oat plat where turnip seed had been produced the previous year. The turnips seeded in the garden made a very heavy yield. About one acre was set out for seed on May 31, using 225 bushels of turnips. These grew rather unevenly this season and ripened so unevenly that it was necessary to gather seed from the field at four different periods. The ripe tops were stored in the grain loft, and they have not been thrashed at this writing.

The demand for Petrowski turnip seed continues from all over the Territory, and nothing but praise for its performance is heard. It is nearly immune to attacks of the root maggot, which is found so abundantly in Alaska gardens.

THE GARDEN.

Peas, cauliflower, cabbage, kale, Brussels sprouts, lettuce, radishes, beets, carrots, parsnips, turnips, spinach, and early varieties of string beans gave heavy returns this season. Cucumbers and tomatoes gave only fair yields out-of-doors, but tomatoes did exceptionally well under cover. The cucumbers were affected by the cloudy weather in July. Roasting ears on sweet corn were grown in the station garden this season with partial success.

FLOWERS.

Flowers grow in great profusion here if given half a chance. At this station great banks of pansies, poppies, candytuft, lobelia, and numerous other varieties were arranged about the yard in most pleasing effect, while the sweet peas nearly screened the cottage porch, and summer cypress (*Kochia trichophylla*) stood in detached groups and in a hedgerow across the front of the yard.

SMALL FRUITS.

Strawberries.—The strawberry crop was nearly a failure in this region this season, owing to the dry weather in June and the extremely cold wet weather following in July. Very few berries set and most of these were imperfect. The first berries were ripe July 6, and there were a few scattering ones over the patch until frost came. The plants made excellent growth, went into the winter in perfect condition, and few winterkilled during the past winter (Pl. VII, fig. 1).

Red raspberries.—Native red raspberries grown under cultivation suffered from the drought to a considerable extent. Many berries set, but as they were late, they failed to attain their natural size, many drying on the bushes.

Wild raspberries.—These were also affected by the cold wet weather of July and were not up to normal size and quality.

Other native berries.—Native blueberries, low and high bush cranberries, and red currants were abundant. Certain sections of the country are well supplied with all varieties of these berries, while other parts have only one or two kinds. The native berries made up into jelly and jams furnish the settlers with a liberal fruit ration.

LIVE STOCK.

The live stock kept at this station consists of a three-horse team for field work, four brood sows, one boar, and five shotes.

Two litters of pigs were raised the past season from which 11 pigs were saved, 3 of them sows and 8 boars. Three boar pigs were sold to settlers for breeding purposes and one for pork. One sow pig died early in the winter from throat trouble which affected its breathing to such an extent that at times it would nearly choke. A small boar pig was injured by an old sow and had to be killed. The pigs were farrowed May 4 and 8 and made only fair growth during the summer, most of them seeming to fatten rather than to make good growth. The pigs, put with the sows on fair wild pasture about the middle of August, ran with the sows until September 15 and were then turned out to run at will about the farm. From that date they began making noticeable growth, and have continued to grow fairly well. Late in October the hogs were taken from the pasture and put in the winter hog house. For a week or more they ventured out on nice days, but after November 1 they remained in the hog house from choice.

The feed used for the hogs consists of potatoes, turnips, grain hay, field-pea hay, clover hay, mixed grains, and screenings from the seed grain. The mixed grains and the screenings were ground before feeding. One-half ton of middlings was used for slop during the fall and early winter. A feed record is kept so as to determine the cost of raising and maintaining hogs under present conditions.

SEED DISTRIBUTION.

Requests for seed from 75 persons were received at this station and supplied during the past season for the 1917 crop, 58 requesting general garden seed, 34 making special requests for Petrowski turnip seed, 17 requests and orders for seed potatoes amounting to 5,000 pounds, and 15 requests for seed grain of wheat, oats, and barley. Seed grain of the different varieties was supplied in 4-pound lots free to all settlers making application. A total of 208 pounds was distributed through the mails in these small lots.

Aside from the above amounts, 4½ tons of seed grain was shipped to Matanuska Station late in the fall for next season's seeding and for distribution among the farmers. From this the farmers doing cooperative work with the station will be supplied. It is hoped that

every farmer who has land under cultivation will avail himself of this opportunity to grow some of these hardy varieties of grain and raise his own seed for future use.

NEEDS OF THE STATION.

The more urgent needs of this station are new machinery to replace the old, which has seen 10 years' service here and several years' service at Copper Center prior to coming here; a new well and complete water system; a sewerage system for the workmen's cottage; and two houses to accommodate the superintendent and the assistant superintendent with their families. The two cottages now in use are needed to house the help employed during the growing season and the harvest.

REPORT OF WORK AT KODIAK LIVE STOCK AND BREEDING STATION.

By HIRAM E. PRATT, *Assistant in Charge.*

CLIMATIC CONDITIONS.

Climate, the chief factor in the agriculture of any region, is especially important in this part of Alaska. Not only is the type of farming limited by the climatic conditions, but the amount of hay and silage that can be secured fluctuates greatly year by year as determined by this same factor. The period including December, January, February, and March, which may usually be classed as winter months, was characterized by a large number of windstorms making traveling on the water uncertain, and during this time 26 inches of snow and rain fell in a total of 47 days—that is, about one day out of every three was stormy. There were 72 cloudy days, 11 partly cloudy days, and only 38 clear days in the period under discussion. The maximum temperature was 48° F. and the minimum —9°.

April, May, and June were cold and cloudy, with 29 cloudy days and only 16 clear days. The maximum temperature was 71° F., the minimum 24°, the average about 39°. Twelve inches of rain fell in the course of 46 different days. This unseasonable weather greatly retarded spring work, it being impossible to begin plowing until the first part of May. Vegetation was slow in starting and crop prospects were unfavorable at the end of this period. July was more favorable for crop and improvement work. Less than 3 inches of rain fell during the month, and of this over half fell on one day. There was 1 clear day and 6 cloudy ones, the remainder being classed as partly cloudy. Vegetation made good growth and the crop outlook was considerably improved.

August and September were both cloudy, 11 inches of rain falling during 33 days, mostly in August. The mean temperature for August was 51° and for September 45°. A number of strong westerly blows during August retarded work with silage, which had to be towed from 6 to 12 miles over water. The first frost of the season occurred September 1, but no killing frost came until the last of the month. The first snow of the year came on October 27, remaining on the ground for the rest of the year. The total precipitation for October and November was 9 inches. The temperature for this period was normal, the average for October being 40° F. and for November 25°. The year as a whole was characterized by a short summer and a long winter and by the lowest temperature on record.

SPRING WORK.

Plowing began May 6, and from that time until June 10 one team was kept going in the field as much of the time as the weather would permit. By June 6 about 14 acres of hillside had been plowed and seeded to oats, 1 acre to oats and vetch, and 1 acre to oats and field peas. After the seeding was finished, the team was used to haul manure to the oat fields, which received 10 tons of barnyard manure per acre. Part of the land, which received no manure, was given a dressing of nitrate of lime at the rate of 250 pounds per acre when the oats were 3 to 4 inches high. That part of the field which was treated with manure looked better and gave a larger yield than that which received the nitrate of lime. When the team was not needed for field work it was utilized in hauling sand and gravel from the beach for the cement work, also in excavating for the cellar of the cottage and in working on the roads. At Kalsin Bay, owing to the lack of horsepower sufficient for deep plowing, only 6 acres of ash was plowed. This was seeded to oats and treated with manure at the rate of 20 tons per acre. A small amount of hay and some fall pasture was secured from this field, but as a crop it was a failure. When the other work would permit, the men were put to clearing brush out of the pasture. Some of the knolls were seeded to grass and given a light dressing of manure.

GENERAL IMPROVEMENTS.

The work of the station along this line was greatly delayed by lack of funds, as no money for general improvement was available until after July 1. The weather also delayed the work considerably. Besides the annual improvement work, such as repairing roads and fences, clearing lands, etc., a number of new buildings were started this year.

At Kalsin Bay an engine house with sterilizer room was built of rough lumber. The building is 16 by 20 feet, of one-story frame con-

struction, with a cement floor. When funds are available, it is planned to finish this building with shiplap and to cover the inside of the sterilizer room with some washable covering. One of the ready-cut cottages purchased last year was erected at Kalsin Bay. As this had to be built during the hay and silage season, its erection was delayed by the lack of competent help. It is now ready for lathing, which will be put on this winter so that it may be plastered as soon as the weather permits in the spring.

A cottage similar to the one at Kalsin Bay was built at Kodiak, for the use of the dairyman. This is complete except for tinting the walls, installing the plumbing fixtures, and laying a cement floor in the cellar. The dairy barn was completely remodeled and put in as nearly first-class condition as was possible. The whole interior was torn out, a cement floor laid in that part of the barn which had been used as a horse stable, and the walls and ceiling were covered with flooring. Two bull pens and 24 cow stalls with cement mangers were installed, and a small grain room was built up-stairs. The whole building was given one coat of paint inside and out. The stalls and other fixtures arrived so late in the fall that after they were installed oil stoves had to be kept burning to prevent the cement from freezing. A ventilator received for this barn has not been installed as yet, owing to the rush of other work.

The remodeling of the dairy barn necessitated finding another place to keep the horses. For this purpose the machine shed was floored and arranged so as to temporarily accommodate two teams. The machinery was sheltered in a lean-to constructed on the north side of this building. A wharf and storeroom for gasoline were built at Kodiak. The storeroom is 16 by 24 feet, the wharf 10 by 40 feet. When a pile driver is available, a 10-by-16-foot extension will be built to the wharf, thus allowing the station boats to come alongside at high tide. A new well, dug at Kodiak this year and connected with the cottage, should furnish an ample supply of pure water for domestic and dairy use as well as for the stock.

FIELD AND FORAGE CROPS.

The breeding and developing of grain and forage crops adapted to Alaskan conditions is not the special problem assigned to this station, that being rather the testing of varieties with the object of finding some crop which can be depended upon to produce winter feed for stock.

The soil upon which the grain tests were conducted this year is a light loam mixed with considerable volcanic ash, forming part of a field which has been planted to oats for the past four years and has been treated with barnyard manure three of the four years. The grain was seeded May 11 on a fair seed bed. When the plants were

from 2 to 3 inches high the plats received nitrate of lime at the rate of 250 pounds to the acre. The grain was cut for hay September 2, but owing to a series of rains, the crop was lost and no weights were obtained. The following notes are based upon observations made during the summer and immediately before harvest. Five varieties of oats were tested, of which Sixty-Day was by far the best, followed by Banner, South Dakota, Finnish Black, and Early Black Norwegian in the order named. Of three varieties of barley tested, all were ready for hay when harvested, and the report given is based upon the estimated yield of hay per acre. Success was first, Finland (bearded) second, and Chittyna (hooded) third, all being 6-rowed varieties. Russian spring wheat was the best of the four varieties grown this year, though Chogot also gave a fair yield of hay, Marquis and Romanow not yielding so well.

Field peas, vetch, alfalfa, and red clover were all given field tests this year, and in addition inoculation tests were made with peas and clover. It is too early to report results from the alfalfa or clover, but the inoculated clover went into the winter in far better condition than that in the uninoculated plat, while the inoculated plats of peas had a better color and were more thrifty in general appearance than the uninoculated plats. Plants from the inoculated plats had fair-sized nodules upon their roots. The results of this year's tests show that the necessary bacilli will grow and function in the soil here. Five varieties of field peas were tested, all of which made good hay. The following is the order of their yield (estimated): Amraoti, Kaiser, Yellow Canadian, Green Canadian, and Golden Vine.

POTATOES.

The test herein reported was carried on upon a piece of fall-plowed hillside land, with a southerly slope. The soil, a mixture of loam and volcanic ash, was rather too wet to give a good yield. The land had produced a crop of cow kale the year before, and after the kale was taken off, it had received manure at the rate of 10 tons per acre and was then plowed. Six pounds of each of the following varieties were planted on May 10: Burpee's Superior, Gold Coin, Early John, Earliest of All, Early Puritan, Rustproof, Irish Cobbler, Green Mountain, Spaulding No. 4, Rural New Yorker, Admiral Dewey, and Knowles's Big Cropper. Knowles's Big Cropper, Burpee's Superior, Gold Coin, and Irish Cobbler gave fair returns. For purposes of comparison, the varieties tested the last two years are given in the order of their yield, those in 1916 being Gold Coin (Matanuska seed), Burpee's Superior, Extra Early Ohio, Irish Cobbler, and Clark's Alaska Seedling; those in 1915 Burpee's Superior, Clark's Alaska Seedling, Extra Early Ohio, and Irish Cobbler. From the small amount of data available, Burpee's

Superior seems to be best adapted to this section of Alaska, but further work on this question is needed.

SILAGE.

Native beach grass (*Elymus mollis*) is the principal plant used for silage. It is found on the low, level land at the head of the bays and in similar locations. Its thick, succulent leaves and stems make it cure slowly for hay, but these same properties make it an excellent silage plant. On strips which are subject to tidal overflows this plant is partially replaced by tall beach sedge (*Carex cryptocarpa*), which, unlike most of the sedges, is soft and smooth and makes an excellent silage. In seasons unfavorable for hay making, native bluetop (*Calamagrostis langsdorfi*) is utilized to a limited extent for silage. When this plant is used in this way, it becomes necessary to add considerable quantities of water and to take extra precautions to see that the silage is well tramped down, especially around the edges of the silo. The silage made from bluetop is inferior to either beach grass or sedge silage, but it is readily eaten by stock. Fireweed (*Epilobium angustifolium*) is fast establishing itself upon the ash-covered flats, and to a less extent on the hillsides. This makes a fair silage when mixed with beach grass, but when any quantity is put into the silo at one time the resulting dark silage is not relished by stock, although they will do well on it when it becomes necessary to use it. None of these plants stands continual cutting well; in fact, when the same field is cut year after year the yield is greatly diminished. However, if it is cut only in alternate years the yield is maintained.

On August 5 a camp was established at the head of English Bay and work begun on silage. A team was kept busy as much of the time as the weather would permit in cutting, raking, and hauling to the skiff. When the skiff was loaded it was towed to Kodiak and unloaded, the grass being run through the cutter, and the skiff sent back for another load. Later the camp was moved to Middle Bay and the work continued. Owing to repeated cuttings the yield was poor, but over 100 tons of good silage was secured.

HAY.

Native bluetop (*Calamagrostis langsdorfi*) is the chief hay grass. This plant is found upon the hillsides and in "parks," varying in size from one to several acres in the cottonwood timber at the head of the bays. This is a rank-growing species with an abundance of thin leaves, which at the right stage cures into a sweet, palatable hay free from dust. Coarse blue grass (*Poa glumaris*), Kentucky blue grass (*Poa pratensis*), and wild barley (*Hordeum boreale*) occur in greater or less amounts mixed with the bluetop, and all make good hay.

Haying began at Kalsin Bay September 3, when a few tons of fairly good hay was secured. September 12 the mower was started again and in the next few weeks 60 tons of good hay was put up, most of it without being rained upon. The oats at Kodiak was cut on September 19, giving about 16 tons of excellent hay. A few loads of vetch and oats and a few of peas and oats were saved from the test plats used for these crops.

FOOD VALUE OF NATIVE GRASSES.

The following table¹ gives chemical analyses of the principal grasses used for hay and silage at Kodiak, together with the analyses of a few standard grasses for comparison. While digestion experiments are needed to properly interpret these analyses, the feeding trials at this station indicate that these grasses have approximately the same digestion coefficients as similar grasses in the States.

Comparative analyses of Alaska and standard grasses.

ALASKA GRASSES (AIR-DRIED SAMPLES TAKEN WHEN IN FLOWER).

Species.	Water.	Protein.	Fat.	Nitrogen-free extract.	Crude fiber.	Ash.
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Bluetop (<i>Calamagrostis langsfordii</i>).....	7.18	4.58	1.03	40.37	42.94	3.90
Sedge (<i>Carex cryptocarpa</i>).....	5.85	10.32	2.12	45.34	25.72	10.65
Beach rye (<i>Elymus mollis</i>).....	11.92	12.71	2.26	35.29	30.31	7.51

STANDARD GRASSES.

Blue grass (<i>Poa pratensis</i>).....	17.44	10.80	3.45	46.10	22.09	7.35
Redtop (<i>Agrostis alba</i>).....	14.30	8.48	2.84	46.77	21.71	5.90
Timothy (<i>Phleum pratense</i>).....	15.01	6.01	3.01	41.90	29.59	4.48

CATTLE.

Galloway cattle.—On September 7, 1916, one of the station cows died, and upon post-mortem examination showed generalized tuberculosis. It was immediately arranged to have the entire herd tested, but owing to the steamship service, it was October 5 before an inspector arrived. On October 5, 6, and 7, 52 head were tested by Dr. Jens Madsen, of the Seattle office, Bureau of Animal Industry, 23 being passed as healthy, 21 condemned as tubercular, and 8 classed as suspicious.

It was decided to keep the condemned cows, maintain them in quarantine, and try to raise healthy calves by the Bang method, which was first developed and put into operation by Dr. Bang, of Denmark, and consists in isolating all animals reacting to the tuberculin test, slaughtering those showing clinical symptoms, and

¹ U. S. Dept. Agr., Bur. Plant Indus. Bul. 82 (1905), p. 19.

raising the calves of the remainder on sterilized milk. Accordingly 6 of the infected animals which had shown clinical symptoms were slaughtered. The carcass of one of these was passed for food, the others being condemned and destroyed. The 15 remaining reactors, the 8 suspects, and all of the calves which had been exposed to infection were taken to Kalsin Bay, where they were kept in separate pastures and under as nearly sanitary conditions as the equipment would permit. The milk from all the cows was pasteurized before feeding it to the calves. The healthy cattle were all wintered at Kodiak.

During the last of July and the first part of August of this year, the cattle at Kodiak and the suspects and calves at Kalsin Bay were again tested, this time by Dr. C. J. Sandwith, also of the Seattle office. Twenty-four head were tested at Kodiak, including 3 calves, 1 of which was only 4 months old. Of these, 6 reacted and 2 were suspicious. Both of the suspects and 1 of the reactors showed clinical symptoms and were slaughtered. The meat of 2 of these was passed for food; the other carcass was destroyed. The 5 remaining reactors were moved to Kaslin Bay and the Kodiak barn given a thorough disinfection.

At Kalsin Bay 8 calves were passed as healthy, 3 reacted, and 3 were still suspicious. The healthy cows and calves were taken to Kodiak, thoroughly disinfected, and turned in with the healthy herd. The suspects were put with the tubercular cows, as it was thought that, having twice reacted suspiciously, they were very probably tubercular. Seven head of the reactors were slaughtered at Kalsin Bay, of which 5 were passed for food and 2 were condemned and destroyed. During this inspection 10 reactors and suspects were slaughtered, 3 carcasses being condemned and destroyed and 7 passed for food.

Two healthy bulls were butchered during the year, 1 of which dressed 290 pounds at 10 months, and the other 230 pounds at 9 months, both being butchered right off pasture. Of the 23 calves dropped during the year, 12 were bulls and 11 heifers. Seven calves died, 2 from scours caused by overheating the milk in pasteurizing, 2 from hair ball, 1 from falling over a cliff, 1 from pneumonia, and 1 was killed when a few days old because of general weakness. One cow died during the year—post-mortem examination failed to show the cause. At Kodiak, there are at present 5 calves and 22 head of cattle 1 year old and over, at Kaslin Bay 11 calves and 20 head over 1 year old, making a total of 58 head.

The feeding period began at Kodiak on November 3, at which time a light feed of hay and silage was given the cows every night. By the end of the month the cattle were on full feed made up of the following ration per 1,000 pounds live weight: Native hay 7 pounds,

beach-grass silage 30 pounds, grain mixture 3 pounds, the grain mixture consisting of 2 parts rolled barley, 2 parts ground oats, and 1 part linseed meal. Milking cows were given 2 or 3 pounds additional of the grain mixture. The cattle at Kalsin Bay were not fed until the middle of November and were not on full feed until the last of the month, when they received practically the same ration as did those at Kodiak. The herds came through the winter in good condition and went on pasture between the middle of May and the first of June. After June 1 only a few of the milking cows received any feed.

Dairy cattle.—The work of developing dairy qualities in the Galloways, taken up by this station in 1914, was continued until interrupted by the discovery of tuberculosis in the herd in September, 1916. The necessary transfer of cattle has seriously interfered with the work since that time. Three Holstein-Friesian cows, 2 heifers, and 1 young bull, purchased over a year ago, were held in the State of Washington until June, 1917, when, with two calves dropped while there, they were shipped to Kodiak, arriving on the afternoon of June 8. They were immediately put in quarantine until the Galloway herd could be retested in the latter part of July. It is planned to make reciprocal crosses between these Holsteins and the more promising of the Galloways and then by breeding and selection to build up a line of cattle more nearly suited to Alaskan conditions. It is hoped that work with these crosses will also throw some light upon the behavior of unit characters. A pure-bred Holstein herd will be maintained from which to supply the settlers who desire that class of cattle.

SHEEP.

The station flock was taken off Near Island (where they had spent the summer) and put in winter quarters at Kodiak on December 13, 1916. The flock at this time consisted of 16 ewes over one year, 6 ewe lambs, 1 two-year-old buck, 2 buck lambs, 4 yearling wethers, and 2 wether lambs, a total of 31. The flock was fed 70 pounds of silage and 15 pounds of hay per day. During the breeding season and again during lambing, each ewe received a pound of grain mixture consisting of 3 parts rolled barley, 3 parts ground oats, and 1 part linseed meal. The flock wintered in good condition. On April 26 the bucks and wethers were transferred to Near Island, but the ewes were kept on pasture at Kodiak until July 10, when they and their lambs were also put on the island.

Seventeen ewes lambled, dropping 19 lambs, of which 12 were saved, 8 ewes and 4 rams. Of those not saved, 2 born with ruptures were killed by the shepherd, 2 were killed by ravens, 1 was killed by dogs, and 2 found dead in the pasture were thought to have been killed by

ravens or eagles. On November 10 9 wethers were sold off pasture, the lambs averaging 83 pounds, the yearlings 134 pounds, and the 2-year-olds 160 pounds. All sold on the local market at 12 cents a pound live weight and the meat dressed from 50 to 55 per cent. The clip from the flock averaged a little less than 8 pounds of wool of good staple and of fair quality, which was fairly clean, but not up to the standard prior to the fall of volcanic ash in 1912. At the present time, December 12, the flock is in good condition and is still on Near Island. This is a grade flock which could be considerably improved by the use of a pure-bred ram of one of the long-wool breeds.

CHANGES IN PERSONNEL.

J. C. Laney, assistant dairyman at this station since July, 1915, left the service and returned to the States April 1. M. D. Snodgrass, superintendent of this station since 1907, was transferred to Fairbanks, and left for his new work August 10, leaving the writer in charge here. H. S. Loyd, a 1915 graduate of the Kansas Agricultural College and the past two years herdsman at the Fort Hays Branch Experiment Station, Hays, Kans., was appointed animal husbandman at this station July 1, 1917.

NEEDS OF THE STATION.

The following are among the more important needs of the station at this time:

(1) An additional skiff or barge. This would permit loading one skiff with hay or silage while the other was being towed to its destination and unloaded and would result in a considerable saving of time when time is valuable.

(2) A cattle barn at Kalsin Bay in which the tubercular cattle may be handled under sanitary conditions. The cow stalls and fixtures for this barn have been purchased and are on hand. A small calf barn with individual pens is almost a prerequisite for success with the calves.

(3) A horse barn and calf shed. The present horse barn, which was built for a machine shed, could be converted into a satisfactory calf shed by putting in more windows, ceiling the interior, and installing the necessary fixtures. This would necessitate the building of a new horse barn and would permit placing it in a proper location. The present horse barn is located too close to the dairy barn.

(4) Some kind of a water-power system, comprising pump, engine, and the necessary storage space for a water supply for the cattle, for domestic needs, and for protection against fire, the danger of which is ever present. An air-pressure system with underground tank is the most desirable type to install in this country of high winds and cold winters.



FIG. 1.—HYBRID STRAWBERRIES WHICH SURVIVED THE WINTER OF 1916-17 WITHOUT PROTECTION AT FAIRBANKS STATION.



FIG. 2.—CONSTRUCTION OF STACK RACK FOR CURING GREEN OR WET HAY, FAIRBANKS STATION.



FIG. 1.—CLEARING LAND FOR MATANUSKA EXPERIMENT STATION, 1917.

Photograph furnished by Alaskan Engineering Commission.



FIG. 2.—A HOMESTEADER IN HARVEST FIELD, MATANUSKA VALLEY.

Photograph furnished by Alaskan Engineering Commission.

(5) A small dairy building in which to carry on the experimental work with the dairy herd. This building could also be utilized to house the water system.

(6) Among the minor improvements, septic tanks and manure pits are the most pressing needs.

REPORT OF WORK AT MATANUSKA STATION.

By F. E. RADER, *Assistant in Charge.*

In 1915 a reservation of 240 acres for an experiment station was made in the Matanuska Valley 2 miles north of Matanuska Junction on the line of the Government railroad 36 miles from Anchorage. Approximately 140 acres of this is fairly level, second, third, and fourth bench land with southerly slopes. The remainder is quite rough and broken, and is good chiefly for grazing purposes. During the present year 640 acres was added to the original reservation, making a total of 880 acres. This second section of land is rough and is at present chiefly valuable for the grazing it will afford, though some of it can be cleared and seeded to pasture grasses. All of the reservation is covered with timber consisting principally of poplar, cottonwood, birch, and spruce in varying proportions, interspersed with bushes of various kinds and supporting a light growth of grass. None of the timber is large, though there is an occasional cottonwood 2 feet in diameter and a few spruce 12 to 15 inches across the stump. With the exception of the cottonwoods, the trees are shallow rooted and not difficult to dig out, but the ground is covered with a tangled mat 4 or 5 inches thick of tree and bush roots, partially decayed vegetation, and moss which must be literally chopped to pieces in clearing green timber land by ordinary methods.

Congress having made the necessary appropriation, active work was begun this year toward the establishment of an experiment station. The first task was to get some land cleared (Pl. VIII, fig. 1). Fortunately there was a very good ground burn covered about 9 acres, mostly third bench land, near which it was thought the permanent buildings might be located. This land was burned in 1915 from fires used by the settlers in clearing a temporary road through the woods. Subsequent winds toppled over most of the trees, which were dry enough by that time to burn readily when cut into convenient pieces and thrown into piles.

As far as possible in the employment of help preference was given to homesteaders. Clearing was begun May 15 with one workman. The force was increased as rapidly as the homesteaders who wished employment finished planting their own crops. The number varied at different times, but averaged about four for all kinds of work for

the 6-month period from May 15 to November 15. Up to August 1, \$4 a day was paid for common labor; after that date, \$4.50 per day of 8 hours. Carpenters were paid \$6 per day.

In order to have a water supply pending a decision as to the location of the permanent buildings, a well was dug at the foot of the third bench near the roadway. It was hoped that water would be found within 12 to 15 feet from the surface, but a depth of 32 feet was reached before water was struck. A rough board building 12 by 16 feet placed near the well for temporary living quarters will probably be used in the future as summer quarters for laborers.

Clearing was carried on as rapidly as possible by the whole force during June and the early part of July. By this time something over $3\frac{1}{2}$ acres had been cleared and some idea of the contour of the land could be gained. The course which a permanent road would take was quite definitely fixed by natural conditions. It was decided to locate the buildings on the third bench near where this road would run on a site protected on the northeast by a low secondary bench covered with timber, which it is planned to leave standing as a protection against the winter winds which frequently blow from that direction. The outlook to the south commands a view of the valley near by, the easterly extremity of Knik Arm, and the mountains on the farther shore.

July was a very showery month, rain falling on 19 days and interfering greatly with the progress of the work, but on July 5 excavation for the basement under the house was started. At the same time work was begun on a telephone line from the station to Matanuska, which, by permission of the Alaskan Engineering Commission, who did part of the work, was connected with their lines and became a part of their system. During the latter part of the month the walls of a log barn were put up. This building is 26 by 28 feet inside and 12 feet at the eaves, with a galvanized corrugated iron roof and a log partition through the center of the lower story. One side is used for storing the implements, the other has two double stalls with good pole floors. It is intended to partition off one corner for a small workshop and storeroom for hand tools, feed, etc. The loft furnishes storage for 3 or 4 tons of hay.

Pouring concrete for the basement walls was begun July 24 and finished August 11, after which work was immediately started on the erection of the house. Fortunately the weather conditions were favorable, and five workmen got the building up and inclosed by September 7, just as a severe storm broke. Another 10 days put it in readiness for lathing. Considerable delay was experienced in getting the plastering done, but it was finally accomplished. The station has a substantially built house 34 by 42 feet with an 8-by-18 foot addition on one corner, one and a half stories high, with a $7\frac{1}{2}$ foot base-

ment under the whole building except the front porch. In one corner of the basement there is a rain-water cistern. Another part will be partitioned off for a house cellar, and it is planned to use the remainder for a furnace room when a heating plant is installed. The first floor contains two bedrooms, bathroom, living room, and dining room, office, kitchen, pantry, closets, and front and back porches. It is planned to finish off this part of the house during the coming winter. The second floor is at present unpartitioned, but it can be divided into three good-sized rooms and several large closets. The house has been wired for electric lights, and the necessary concealed plumbing has been done.

No attempt was made to do any experimental work this season. One and a half acres was plowed and seeded to common oats on June 22, the object being to grow feed. The oats came up promptly and grew very rapidly. About the middle of August, the oats was cut and fed green to the team, the ration of timothy hay being gradually lessened until nothing but the green oats was fed for roughage. The oats was just beginning to blossom when further growth was checked by severe frosts on September 19 and 20. A week later the acre which remained was cut and cured for hay. The oats lodged so badly during a storm early in the month that it had to be cut with scythes. As the weather did not appear to be very favorable for curing hay on the ground, the oats was hung on role racks to cure—Swedish style. As the weather remained dry, about 3 tons of well-cured hay was secured in a week's time at an approximate cost of \$12.50 per ton for cutting and curing, exclusive of the cost of cutting the poles and getting the posts ready. This took the time of one man for $3\frac{1}{2}$ days, but as they will last for a number of years, the cost of preparation could not properly be charged against a single crop. By this method of curing, good hay can be made when it would be impossible to cure the crop at all on the ground, and at a cost which is not prohibitive.

Much more help could have been used to advantage at clearing, but labor was scarce during the middle and latter part of the season. However, the work was continued until November 13 and a total of $9\frac{1}{2}$ acres was cleared by day labor without the use of any machinery or tools other than hand tools. Plowing was continued as long as the weather would permit and about two-thirds of this area was fall plowed. Practically all of the land cleared this year was average burned land. Some was well burned, that is, no standing trees or patches of sod were left; some had a few green trees still standing and a considerable portion covered with sod; and a small portion was green timber. It was impossible this year to keep account of the cost of each kind of clearing. It cost \$60 per acre to clear the first 2 acres of well-burned land; the average cost for the $9\frac{1}{2}$ acres was \$106.85 per acre; while $2\frac{1}{2}\frac{3}{8}$ acres of fourth-bench land was cleared

by contract for \$110 per acre. This makes a total of a little over 12 acres which can be cropped next year.

The station is well equipped with the usual farm implements, such as stump puller, breaking plow, sidehill plow, drag harrow, disk harrow, mower, rake, grain drill, one-horse cultivator, two-horse cultivator, wagon, bobsled, blacksmith tools, pipe tools, carpenter's tools, and the ordinary hand tools. Others will be added from time to time as the need for them arises.

The only live stock at present is a team of mares. Other live stock will be added as rapidly as the feed for maintaining them can be grown.

COOPERATIVE WORK.

By M. D. SNODGRASS, *Assistant in Charge, Fairbanks Station.*

Cooperative work among the settlers of Alaska has been carried out as far as available funds would allow. The work for the past season has been confined largely to the Matanuska and Anchorage-Knik region. The time given to this work exclusively was from April 7 to May 13, when the writer made a trip from Kodiak to Matanuska Valley and the Anchorage-Knik region. Owing to poor boat connections it required four days to reach Anchorage, allowing two days between boats at Seward.

The snow was 6 inches deep at Anchorage April 11, but was thawing fast. Reports from Matanuska at that date showed that snow was gone from the level and from the southern slopes. Four days were spent listing applicants for seed and getting record sheets made up for the work. Examination was then made of additional lands in the Matanuska Valley for the experiment station at that place, and several near-by farms were visited. All field work except hand clearing was impossible at this date, April 16, and roads were almost impassable.

On April 18 one-half ton of seed grain was received from the interior station, also about 500 pounds of nursery stock and garden seed from Sitka Station. The work of making up the seed and nursery allotment was begun at once. There were 78 applications for seed grain and 74 for nursery stock and garden seed. Accordingly, the seed grain was divided into packages from $1\frac{1}{4}$ to 4 pounds each of the 6 varieties under test, and 7 kinds of nursery plants were divided and made up into separate packages for each applicant. This seed and nursery stock was distributed personally when possible, and the remainder was sent through the mail to settlers living off the railway and farther up the valleys.

Each cooperator was required to sign an agreement that the seed would be grown for seed purposes, and that all data required would be kept and a report made at the close of the season. Record sheets

were furnished each grower with instructions as to keeping the records.

Personal visits were made to as many farms as the allotted time would permit. Methods of cultivation and preparation of seed beds were studied and discussed with the farmers. Notes on general improvements during the past year were made. The rate of clearing farm land in certain sections was most gratifying. The one great need of the settlers encountered everywhere was roads. Those living close to the railroad are fortunate in the matter of roads. Naturally, the improvements are greater near the railroad, but in many places where it was possible to get a wagon road through the rate of improvement and clearing of land is quite satisfactory.

Great interest in agricultural experiments was shown by the majority of the settlers, and nearly all were anxious to tackle the problems confronting them. The newness of the country and the lack of reliable information as to what grain crops may be depended upon make it necessary for everybody to try things for himself (Pl. VIII, fig. 2).

At Matanuska the settlers have a thriving Farmers' Association, of which the majority of the farmers are active members. The problems of buying and selling as an organization have been taken up with fair prospects of good results. Through the instrumentality of this association the Alaska Engineering Commission has revised and lowered freight rates on many farm products and on some of the necessary farm machinery, equipment, and breeding stock, which the settlers are now obliged to ship into the country.

The seed grains tried out this season were as follows: Finnish Black oats, Romanow spring wheat, Siberian H. G. wheat, beardless barley (S. P. I. No. 19852), hull-less barley (S. P. I. No. 19851), and Japanese buckwheat. Romanow spring wheat has not come up to standard and is perhaps too late in maturing in that locality. It will be tried another season, however. Some of the other grain was matured in a number of instances, but there were many failures to mature grain this season. The spring was later than normal and the summer much wetter than usual. In fact, it was almost impossible to save any grain where it did mature. Reports have been received from only 15 out of the 78 settlers furnished seed. Of the 15 cooperators making report, only 5 matured and saved seed grain. The remainder cut the grain for hay.

Seven out of 13 reports on Black Finnish oats show that this variety matured a very fair yield. The number of days from seeding to maturity ranged from 106 to 124, averaging 116 days. The growth was very heavy, and lodging was caused by heavy rains and wind.

From 9 reports on beardless barley it is shown that the grain matured in 4 instances, the number of days from seeding to maturity ranging from 100 to 124 and averaging 109 days. The average height

was 48 inches, and the yields were estimated at 22 to 40 bushels per acre. In some cases the barley lodged.

Hull-less barley matured in half of the trials reported, yielding at rates ranging between 26 and 44 bushels per acre. The average number of days from seeding to maturity was 114 and the range from 108 to 124 days. The height averaged 40 inches. Lodging was reported in a few cases.

Russian H. G. wheat matured at an average of 110 days from seeding, ranging from 100 to 128 days, with yields estimated at 17 to 35 bushels per acre. Several cases of failure to mature seed were due to late seeding.

Buckwheat matured in only two of the trials reported.

From reports and personal letters received from the settlers, who are unused to making and recording observations on growing crops, it is quite difficult to get a comprehensive idea of the results obtained. The unfavorable weather conditions for ripening and curing grain in the Matanuska Valley the past season disheartened a considerable number of the settlers. Many of them, however, not recognizing defeat, are preparing to double their efforts at clearing land and planting crops next year.

The principal money crop of the early settlers in that region is potatoes (Pl. IX), with garden vegetables cultivated to some extent. These crops were of the very best quality and made a good yield the past season. It is estimated that about 3,000 tons of potatoes was grown in the valley this season, and a ready market was found for the greater part of the crop.

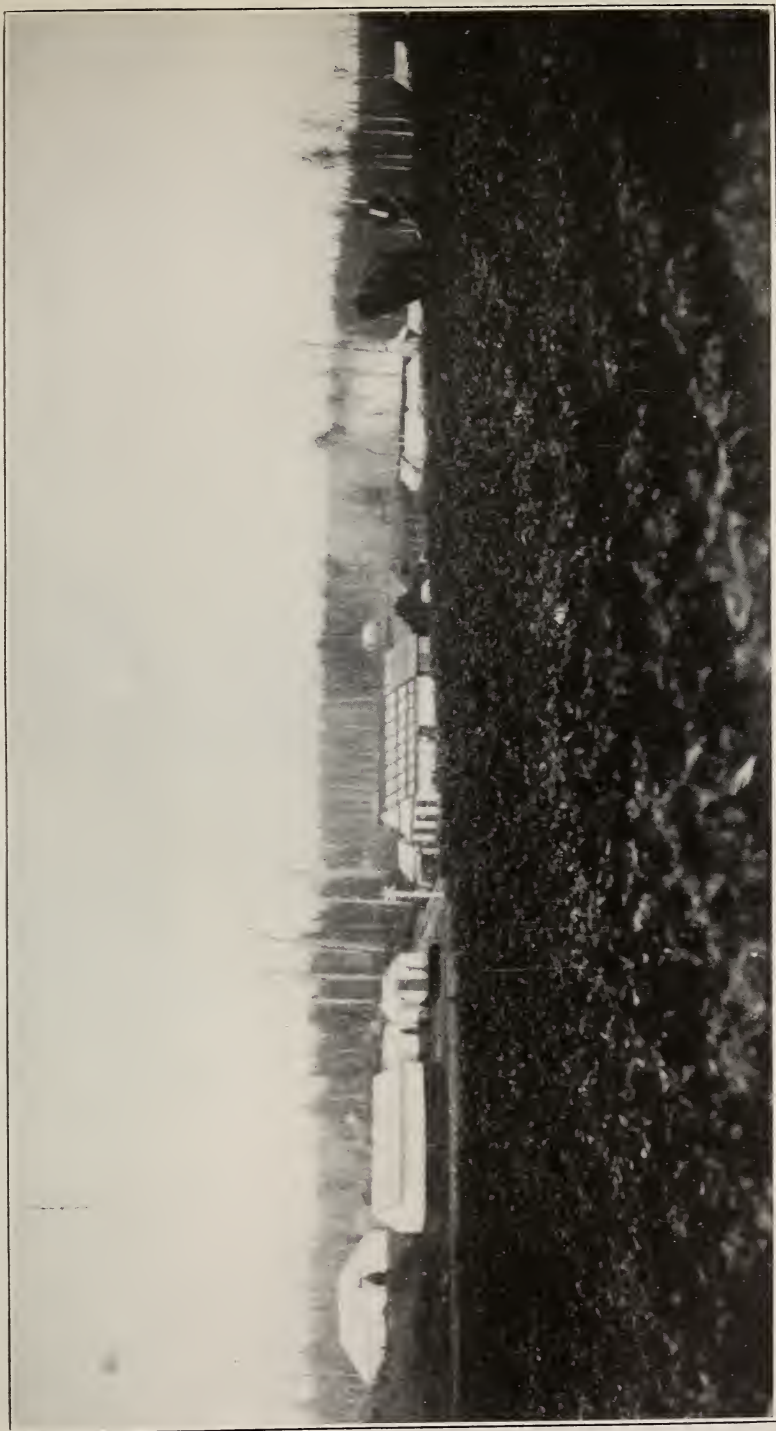
The cooperative work will be extended to the Tanana Valley the coming season and continued along present lines until funds are available for more comprehensive work.

REPORTS FROM SEED AND PLANT DISTRIBUTION.

To anyone interested in the agricultural activity of Alaska, these letters will be of special interest. They contain the actual experiences of settlers domiciled in different parts of the Territory, and they should convey important information on the possibilities of the various localities.

Eleanor J. Ridgway, Allakakat, Alaska.—I scarcely need to state that it was a cold summer. We had but three days with a temperature of 80° or over. Our "Mission" garden was planted during the first week of June. While the cabbages, Brussels sprouts, and cauliflower were all started early in the greenhouse, the potatoes were put to sprout three weeks before being planted. This year our potatoes froze on August 21.

The Petrowski turnips were very successful. They are not pithy but are good and solid. This year there were four native gardens, and they were all successful in raising good turnips. The purple top and white turnips, also kale, do well in the new gardens.



FIELD OF POTATOES NEAR TOWN OF WASILLA, MATANUSKA VALLEY.

Photograph furnished by Alaskan Engineering Commission.

We expect to have six gardens here this next summer besides the mission garden, and I would appreciate it much if we could have seed for them.

H. C. Alexander, Amalga, Alaska.—There are 10 homesteads being farmed in this district which has five families and five bachelors. About 40 acres has been plowed up and seeded to vegetables, grains, and berry plants. The live stock of the valley consists of 8 horses, 2 mules, 2 calves, 1 cow, 8 hogs, and about 70 chickens.

I have been in several States for short periods and was born in Missouri, but I never saw a place where most things grow as they do here.

Tom L. Johnson, Aniak, Alaska.—I have cleared and put under cultivation some ground and have used Government seed. My principal crop is potatoes, which do well at this particular place. The quality is excellent, dry, and mealy. I will find time to make a more complete report later on the other truck. I am taking a lot of interest in these yearly reports, and I wish you would send me a copy.

Earl E. Davis, Chicken, Alaska.—The Sudan grass seed, which you kindly had forwarded to me from Seattle, arrived O. K. We put part of the seed in on Chicken Creek and a small part up Mosquito Fork of the Forty Mile at Mr. R. C. Mitchell's hay ranch. In 20 days the grass was about 4 inches above the ground. It then turned black and that was all there was to it.

John B. Powers, Eagle, Alaska.—The picture accompanying this letter shows a "Southwick" hay press in action. The picture was taken in front of my barn at Eagle, October 26, 1917. We are baling native oat hay. The crop of oat hay about Eagle this past summer was very good. The native grass "redtop" hay crop was poor.

A. S. Jones, Fairbanks, Alaska.—I received the seeds safely and also the Petrowski turnip seed, which, as usual, turned out fine. Some of the neighbors saw the seed and desired to get some, but we had none to spare. I received the literature which I read with both profit and pleasure. I obtained 300 pounds of Gold Coin potatoes from the Fairbanks Station, and I raised from them a crop of 3,000 pounds. They were the largest and best quality of potatoes that we ever raised on this ranch.

John McRae, Franklin, Alaska.—Almost all vegetables were a failure this season. The first part of the season was very cold and kept everything back, and in the latter part redbugs appeared and ate nearly all the leaves off the turnips, and they were a failure all over the district. Potatoes did fairly well this year, but were somewhat affected by a frost in July, and again by a slight frost in the latter part of August.

I would like to have you send me a little alfalfa seed, to see how it grows in this part of the country. There is plenty of native hay here, and the horses seem to like it. About 20 tons of it is cut here every year.

P. B. Allen, Haines, Alaska.—I wish to thank you for the seed you sent last spring; also for the shrubbery, all of which did quite well. The yellow turnips did especially well. Our homestead is on the Lynn Canal, 2½ miles north of Haines. The south winds warm up the truck garden earlier than most gardens at Haines, so we have a place especially adapted for early peas and turnips.

We have had splendid success with hens generally, and I am sure milch goats would be a great blessing if one could protect them without too great expense.

We get a fine lot of seaweed with each southeaster and would be glad to get any information you can give us in regard to the use and preparation of it. I especially appreciate your annual report and am anxiously waiting for the next number.

A. T. Whyte, Juneau, Alaska.—Last spring you kindly sent me an assortment of seeds. You no doubt know of the miserable weather we had the past season. If the weather had been a little more favorable the results would have been fine. Everything I planted came up nicely, but most of the things did not mature because they were under water a large part of the time. Kindly favor me with a rosebush if you have any for distribution.

A. E. Thompson, Kiana, Alaska.—Will you kindly place me on your mailing list and send me some seed. I especially want peas, celery, lettuce, carrots, turnips, cabbage, and cauliflower. Please send such varieties as will be best suited for this section of the country. It has been very hard to get fresh seeds in these parts. I begged some from missionaries and Government teachers, but it was too old. Gardens in this section thrive very well in favorable seasons, but this season was exceptionally unfavorable. Frosts in July killed the potatoes.

C. H. Wilson, Knik, Alaska.—I planted the seeds I received from you and some of them did very well. The carrots, beets, peas, kohlrabi, and turnips were very good. Cabbage was almost a total failure, and nobody raised any around here this year. The following-named flowers did well: Stock, mignonette, nasturtiums, poppies, gypsophila, chrysanthemums, and delphinium. The last named still bloomed after several heavy frosts.

A year ago last spring I got 6 apple trees from Sitka. They lived but did not make much growth and 3 of them were winterkilled; that is, the stem died. The roots lived and sent up rather feeble shoots. They are on the sunny side near the top of a rather dry ridge. The soil may not be very good. The strawberries I got with the apple trees did excellently this year, and next year I shall have lots of strawberries.

Henry Copple, Kotzebue, Alaska.—I wish to thank you for past favors of sending me garden seeds and hope you will continue to send them. I have been dividing my seed with the other boys around here. Everybody around here is garden mad, and each fellow says he will have the best garden next year. I wish you would send me some Petrowski turnip seed, as they are free from the attacks of the maggot. You sent me some that were grown at Fairbanks that did fine. I will write you the result of next year's garden race and tell you who is the best around here.

R. S. Hall, Kotzebue, Alaska.—I have been raising a garden for the past three years at Kotzebue, and I always had to borrow seeds from the natives and others. I wish you would put my name on your seed distribution list. I have been having fairly good success in the line of potatoes, onions, carrots, turnips, parsnips, beets, and garden greens.

Archie McClellan, Mary Island Light Station, Ketchikan, Alaska.—Almost all the seeds I received from your station did exceptionally well, although the season was late, with heavy rains. Can you advise me as to the best way of using kelp or seaweed for fertilizer? I have dug up the ground here and buried the kelp in the fall. If you could send me some seed potatoes and gooseberry bushes I would appreciate it.

Mrs. L. F. Pingel, Nolan, Koyukuk, Alaska.—Report of Government seed planted on Nolan Creek nearly a thousand feet above the level of the Koyukuk River:

Turnips: White turnips are a favorite for early greens, but are apt to be wormy. We enjoyed turnips all summer and have a good supply buried in the sand for winter. Last year I salted some, peeled, and sliced; they were satisfactory. Petrowski turnips are by far the best for us. They are not troubled by worms, are hardy, easy to keep, and have an excellent flavor. They weigh about 2 pounds.

Beets: Their rapid growth was a surprise, and the size they attained brought much comment from the old-timers, "who lived here so many years and never saw the like."

Lettuce had an excellent start the first week in June, but a cold, dry spell checked the growth. However, as I started some in each of 3 gardens besides a hot box there was always enough and plenty to spare.

Another record-breaking result came from the Government seed onions. Their rapid growth was a surprise, and we had nice onions all summer. When we consider that onions sell up here for 22 cents a pound your seed was a good investment and we are grateful for it.

Beans were tried for the second time, but the season is too short to grow them successfully.

Celery was as large and fine as could be grown; cabbage had good-sized heads; kohl-rabi and kale had to be replanted, but turned out fine.

Among the flowers sweet alyssum, candytuft, nasturtiums, and the Giant poppies are no longer an experiment. They grow fine up here.

Thos. Jacobs, Port Walter, via Petersburg, Alaska.—I wish to let you know the results from planting the seed you sent me. I planted a little of most of the seed you sent, but had very poor success on account of the weather and the root maggots. The Petrowski turnip did better than anything else. I would like to have you send me a package of seed for next year.

H. L. Long, Seward, Alaska.—The present year I have cleared about 2½ acres, with the exception of some stumps. My homestead is extra heavy clearing, and I estimate the cost per acre to be from \$250 to \$400. It takes about 100 pounds of giant powder to raise the stumps on an acre. I had about one-fourth of an acre in garden this year. I planted 25 pounds of potatoes on some old ground, and I dug close to 200 pounds. I will have 100 pounds of good seed potatoes next year. The Petrowski turnip did very well considering the new ground, and I had all the lettuce and radishes I could use all summer.

I would like some rhubarb roots in the spring, also some seed. Any suggestions you may make will be appreciated very much.

J. H. Conway, Wasilla, Alaska.—I received the seed and some grain for planting. I planted it all on May 15, and the bearded barley ripened 15 days ahead of the balance. Oats, wheat, and beardless barley ripened about the same time, but the buckwheat did not ripen until snowfall. I want berry bushes of every kind. The allotment you sent me this year all did fine. A few strawberries ripened and were of good size and fine flavor.

I would like to try some hardy spring wheat and alfalfa, but what we need most of all is a first-class potato. There is not one in this valley that I know of who hasn't the poorest kind of potato. One got the seed of the other and consequently we all have a very inferior kind. I am very enthusiastic over the prospects here when once we get started properly.

J. K. Calbreath, Wiseman, Koyukuk, Alaska.—I wish to say that all the seeds sent were good, especially the Petrowski turnip seed. I sowed all I had and raked them over and had a great crop, the roots weighing from one-half to 2 pounds. I never witnessed anything like it, and the best of all, our dogs are very fond of them. Man feed, dog feed, or any other kind of grub here is awfully high—bacon, 75 cents; flour, \$24 per hundred; cornmeal, \$2.50 for a 10-pound sack, and other things in proportion. So you see we have all got to dig gardens now in order to prospect. I would like to have enough Petrowski seed to plant a quarter of an acre or more, and other seeds also, as the Government seeds have always done well. There is no reason why the prospector should not raise his own vegetables, which I consider half of the grub stake.

Frank Slaven, Woodchopper Creek, Alaska.—I received your reports and bulletins, which are very useful to have at times when needed. Our gardens did

splendidly this past summer as we were not bothered with frosts. We also had oats and barley that ripened, and our potatoes were fine.

We do not make a business of farming, as it is only a side issue with our mining land. We do not have sufficient fertilizer to get the best results, but our efforts show what might be raised in these parts with proper cultivation.

W. E. Parrott, Wrangell, Alaska.—The past season was too cold and wet for any reasonable growth. Cabbage was a failure; carrots were good, as were also beets. Two varieties of potatoes, Gold Coin and Model Market, produced a fourth of a crop. Nothing came of lettuce, radishes, and peas. Turnips and rutabagas planted in early May were destroyed by a root maggot. Some planted June 15 were not bothered by the maggot and made good.

Twelve hundred strawberries came into bearing. They set fruit well, but July, the month for them to mature, was so wet I got but one setting of berries, and I was compelled to cook them for preserves or lose all. I did not make anything this year, but I will hit it hard to make up for the loss of the past season.

WEATHER REPORTS FOR 1917.

The following tables give in condensed form the character of the weather at each of the stations named. The headings of the tables are so plain as to be self-explanatory.

Condensed meteorological reports.

ALLAKAKAT. Latitude 66° 34', longitude 152° 44'. Eleanor J. Ridgway, observer.

Month.	Temperature.					Total pre- cipitation.	Number of days—			
	Maximum.	Minimum.	Mean maximum.	Mean minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1917.	° F.	° F.	° F.	° F.	° F.	Inches.				
January.....	.....	-70.5	.....	-54.7	.....	.....	23	3	5	.....
February.....	.....	-65	.....	-22.7	.....	0.80	12	6	10	7
March.....	.....	-48	.....	-13.2	.....	.....	11	12	8	.....
April.....	53	-22	33.7	2.1	17.9	.....	22	4	4	0
May.....	77	-3	51.2	24.8	38.0	.33	19	7	5	.....
June.....	79	29	67.6	46.4	57.0	.55	11	13	6	2
July.....	81	27	66.8	45.7	56.2	2.87	8	11	12	2
August.....	77	25	68.5	38.3	53.4	.50	15	11	5	.....
September.....	67	18	49.8	33.7	41.8	2.30	4	7	19	.....
October.....	45	-28	27.4	11.1	19.2	.79	12	9	10	.....
November.....	17	-59	-13.4	-32.3	-22.8	.45	21	3	6	5

ANCHORAGE. Latitude 61° 13', longitude 149° 54'. D. D. Vint, observer.

1917.										
January.....	47	-29	18.8	-1.9	8.4	1.65	5	10	16	8
February.....	44	-31	28.5	5.8	17.2	.87	8	9	11	2
March.....	43	-11	33.0	14.1	23.6	.66	6	9	16	7
April.....	51	4	42.3	21.2	31.8	.13	14	10	6	2
May.....	62	27	51.5	36.4	44.0	.91	5	9	17	7
June.....	68	33	58.5	45.0	51.8	.70	9	5	16	9
July.....	69	36	61.7	48.3	55.0	2.45	11	3	17	16
August.....	72	37	64.3	46.3	55.3	1.54	7	5	19	14
September.....	65	23	53.7	39.1	46.4	2.57	7	7	16	16
October.....	62	0	41.5	25.1	33.3	1.67	8	6	17	11
November.....	36	-18	23.3	7.0	15.2	.98	8	9	13	12
December.....	26	-36	-2	-18.3	-9.2	.07	23	1	7	2

Condensed meteorological reports—Continued.

CALDER. Latitude 56° 8', longitude 132° 27'. John McCallum, observer.

Month.	Temperature.					Total pre- cipitation.	Number of days—			
	Maxi- mum.	Mini- mum.	Mean maxi- mum.	Mean mini- mum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1917.	° F.	° F.	° F.	° F.	° F.	Inches.				
January.....	45	- 9	30.7	19.9	25.3	9.49	7	8	16	19
February.....	45	- 6	32.9	21.7	27.3	5.02	9	8	11	13
March.....	48	14	39.3	25.0	32.2	7.67	7	13	11	16
April.....	63	22	49.9	29.5	39.7	4.45	14	9	7	10
May.....	61	25	52.2	35.1	43.6	3.38	10	12	9	13
June.....	71	32	56.7	41.2	49.0	4.13	4	14	12	16
July.....	64	39	57.7	45.1	51.4	5.16	7	9	15	19
August.....	67	37	60.4	48.0	54.2	10.50	8	11	12	20
September.....	73	34	56.7	40.9	48.8	16.82	10	1	19	20
October.....	57	26	47.8	33.6	40.7	21.10	2	9	20	29
November.....	53	19	46.0	35.1	40.6	33.07	.....	3	27	30
December.....	47	1	28.3	19.2	23.8	11.10	5	3	23	21

CANDLE. Latitude 65° 55', longitude 161° 57'. R. S. Dimmick, observer.

1917.										
January.....	32	-52	-19.2	-32.0	-25.6	.....	18	1	12	.....
February.....	34	-42	14.6	- .1	7.2	.....	.....	.....	.....	.....
March.....	36	-30	18.4	5.4	11.9	.....	.....	.....	.....	.....
April.....	40	-20	23.6	- .2	11.7	0.18	.....	.....	.....	1
May.....	70	0	45.2	25.8	35.5	.27	12	2	17	3
June.....	78	30	58.9	40.8	49.8	1.93	5	9	15	9
July.....	76	22	54.9	41.7	48.3	1.87	5	7	16	11
August.....	75	30	61.5	44.0	52.8	1.26	6	6	17	11
September.....	60	16	45.6	33.4	39.5	1.32	3	7	19	10
October.....	44	-14	26.4	14.8	20.6	.76	5	4	18	6
November.....	6	-30	- 5.9	-16.9	-11.4	.....	17	4	7	.....
December.....	8	-44	-13.8	-24.2	-19.0	.....	13	5	49	.....

CHITINA. Latitude 61° 32', longitude 144° 27'. Fred M. Schaupp, observer.

1917.										
March.....	44	-20	31.1	5.8	18.4	0.39	11	9	11	3
April.....	60	- 5	44.7	16.7	30.7	.05	20	6	4	1
May.....	74	20	53.8	34.3	44.0	.69	9	3	19	3
June.....	77	35	65.2	44.0	54.6	.47	10	7	13	3
July.....	81	35	61.5	45.5	53.4	1.56	4	9	18	14
August.....	72	28	64.4	44.5	54.4	.25	13	5	13	4
September.....	71	20	53.6	37.7	45.6	1.36	7	3	20	8
October.....	49	3	36.7	21.9	29.3	1.82	4	1	15	12
November.....	37	-40	17.1	- .4	8.4	1.96	5	2	23	13
December.....	29	-58	-23.1	-40.1	-31.6	.45	7	2	22	4

DUTCH HARBOR. Latitude 53° 54', longitude 166° 32'. Emil Ittner, observer.

1917.										
January.....	42	12	33.5	24.1	28.8	7.04	4	4	23	16
February.....	45	22	37.9	30.6	34.2	10.96	7	7	14	12
March.....	53	18	38.8	28.2	33.5	3.06	4	9	18	17
April.....	48	22	39.1	30.0	34.6	3.08	7	5	18	12
May.....	54	22	46.4	36.6	41.5	3.68	6	5	20	12
June.....	64	36	52.3	41.1	46.7	1.11	5	11	14	5
July.....	80	38	60.7	46.3	53.5	2.82	4	13	14	10
August.....	64	36	56.4	44.8	50.6	1.70	.....	2	29	11
September.....	72	36	52.9	41.5	47.2	4.74	2	.....	27	25
October.....	52	26	46.6	34.8	40.7	8.64	4	5	22	18
November.....	46	20	34.0	27.3	30.6	1.84	3	2	25	18
December.....	46	22	36.5	31.4	34.0	9.14	1	.....	30	20

¹ Record for 1 day missing.² Records for 3 days missing.³ Records for 2 days missing.⁴ Records for 4 days missing.

Condensed meteorological reports—Continued.

EAGLE. Latitude 64° 46', longitude 141° 12'. N. R. Meyers, observer.

Month.	Temperature.					Total pre- cipita- tion.	Number of days—			
	Maxi- mum.	Mini- mum.	Mean maxi- mum.	Mean mini- mum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1917.	° F.	° F.	° F.	° F.	° F.	Inches.				
January.....	30	-60	-12.0	-32.9	-22.4	0.28	15	4	12	10
February.....	35	-62	7.5	-12.2	- 2.4	.62	10	4	14	7
March.....	36	-33	22.3	- 1.7	10.3	.34	10	6	15	6
April.....	59	-13	43.4	13.2	28.3	.09	12	11	7	2
May.....	75	7	53.3	29.0	41.2	.50	7	11	13	5
June.....	77	25	66.8	41.0	53.9	2.26	8	12	10	12
July.....	76	34	67.0	44.7	55.8	1.71	1	7	23	20
August.....	87	32	69.1	40.2	54.6	.74	9	11	11	11
September.....	74	16	56.0	33.9	45.0	.75	5	9	16	7
October.....	57	-13	30.9	15.5	23.2	.69	3	9	19	13
November.....	9	-54	- 4.4	-17.1	-10.8	.65	7	4	19	11
December.....	-25	-63	-40.2	-51.5	-45.8	Trace.	27	2	2	.....

AGRICULTURAL EXPERIMENT STATION, FAIRBANKS. Latitude 64° 50', longitude 148° 9'.
M. D. Snodgrass, observer.

1917.										
January.....	40	-53	-10.0	-29.4	-19.7	0.41	18	7	6	5
February.....	39	-40	20.2	- 2.0	9.1	.42	14	6	8	6
March.....	45	-25	28.8	4.6	16.7	.20	10	14	7	5
April.....	63	- 9	48.2	17.3	32.8	.24	21	6	3	1
May.....	83	12	59.9	31.4	45.6	.35	14	15	2	2
June.....	83	33	70.5	44.9	57.7	1.09	6	20	4	12
July.....	83	35	66.9	44.9	55.9	4.11	3	19	9	22
August.....	87	35	73.3	43.0	58.2	1.48	9	18	4	8
September.....	78	20	57.7	31.4	44.6	.28	4	21	5	7
October.....	64	-11	34.4	14.7	24.6	.64	7	17	7	12
November.....	21	-48	- 2.7	-17.7	-10.2	.40	7	13	10	5
December.....	-11	-52	-25.4	-41.1	-33.2	.22	23	8	.....	5

FORTMANN SALMON HATCHERY. Latitude 55° 40', longitude 131° 25'. Fred Patching, observer.

1917.										
January.....	41	-12	30.5	19.5	25.0	10.39	8	2	21	16
February.....	44	- 2	34.0	19.8	26.9	7.67	8	.....	20	14
March.....	48	14	41.8	25.4	33.6	8.07	2	9	20	19
April.....	68	19	51.5	28.7	40.1	7.71	10	5	15	14
May.....	76	27	59.7	36.2	48.0	6.25	5	16	10	15
June.....	73	34	61.4	43.2	52.3	6.13	6	8	16	19
July.....	77	40	64.3	47.1	55.7	8.69	8	4	19	21
August.....	81	41	66.8	50.2	58.5	13.07	8	5	18	23
September.....	78	38	62.2	43.9	53.0	15.17	9	3	18	19
October.....	60	33	49.9	39.6	44.8	21.48	2	4	25	28
November.....	60	22	50.9	37.9	44.4	43.06	.....	8	22	30
December.....	50	-12	34.5	17.4	26.0	14.80	5	8	18	24

JUNEAU. Latitude 58° 18', longitude 134° 24'. M. B. Summers, observer.

1917.										
January.....	41	-12	27.5	18.6	23.0	10.26	4	3	24	20
February.....	46	-15	32.4	22.1	27.2	5.91	13	3	12	13
March.....	45	18	38.3	28.5	33.4	4.20	6	3	22	19
April.....	64	25	51.0	32.8	41.9	1.69	9	10	11	7
May.....	69	30	54.7	39.5	47.1	3.53	7	7	17	14
June.....	75	40	58.5	45.3	51.9	5.30	2	6	22	18
July.....	73	41	58.0	47.4	52.7	10.50	4	2	25	23
August.....	78	40	60.9	48.3	54.6	11.08	4	6	21	22
September.....	69	41	56.7	44.3	50.5	12.27	8	2	20	11
October.....	55	28	46.5	38.0	42.2	18.64	1	4	26	26
November.....	54	8	41.9	32.8	37.4	16.77	2	2	26	29
December.....	37	- 2	17.8	11.4	14.6	6.37	5	1	25	29

Condensed meteorological reports—Continued.

KENNECOTT. Latitude 61° 31', longitude 142° 56'. R. V. Watkins, observer.

Month.	Temperature.					Total pre- cipita- tion.	Number of days—			
	Maxi- mum.	Mini- mum.	Mean maxi- mum.	Mean mini- mum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1917.	° F.	° F.	° F.	° F.	° F.	Inches.				
January.....	41	-35	18.6	- 3.5	7.6	2.86	18	1	12	9
February.....	46	-39	25.2	0.0	12.6	1.85	18	.....	10	4
March.....	45	- 4	33.0	10.6	21.8	.90	18	.....	13	1
April.....	58	0	41.0	15.9	28.4	.....	.....	.....	.....	.....
May.....	67	22	53.7	30.9	42.3	.....	22	1	8	.....
June.....	72	35	66.1	37.4	51.8	.....	19	1	10	.....
July.....	74	35	64.3	38.4	51.4	.....	.....	.....	.....	.....
August.....	72	35	66.5	39.2	52.8	.....	22	3	6	.....
September.....	74	20	59.9	32.2	46.0	.....	10	4	16	8
October.....	52	- 3	36.6	20.0	28.3	.55	11	1	19	9
November.....	42	-24	17.8	- 5.0	6.4	.66	13	.....	17	7
December.....	3	-43	-18.0	-24.8	-21.4	.62	28	.....	3	4

KETCHIKAN. Latitude 55° 20', longitude 131° 37'. A. P. Craig, observer.

1917.										
January.....	44	- 5	33.6	23.2	28.4	10.99	8	.....	23	17
February.....	49	2	37.0	24.0	30.5	10.37	9	.....	19	14
March.....	50	20	42.2	28.1	35.2	7.56	8	6	17	16
April.....	67	25	52.4	31.7	42.0	8.25	15	6	9	12
May.....	.....	27	.....	35.8	.....	6.30	10	10	11	13
June.....	73	35	59.9	42.6	51.2	10.00	8	5	17	13
July.....	72	38	62.4	45.5	54.0	10.08	8	2	21	19
August.....	77	40	64.8	47.7	56.2	25.07	7	7	17	24
September.....	77	34	60.6	42.8	51.7	13.27	10	1	19	20
October.....	59	31	50.3	38.7	44.5	23.46	3	1	27	30
November.....	57	26	48.6	37.3	43.0	53.85	1	1	28	29
December.....	52	0	32.9	22.2	27.6	11.11	6	.....	25	24

KLUKWAN. Latitude 59° 25', longitude 136°. Rev. F. R. Falconer, observer.

1917.										
January.....	39	-25	19.1	3.5	11.3	1.49	12	4	15	16
February.....	42	-35	26.4	7.3	16.8	1.11	18	.....	10	9
March.....	47	0	37.6	17.9	27.8	.63	17	3	11	11
April.....	67	5	51.8	24.7	38.2	.33	25	3	2	2
May.....	74	23	58.2	35.8	47.0	.29	15	6	10	4
June.....	83	39	65.5	45.0	55.2	.47	17	1	12	5
July.....	75	37	62.7	46.3	54.5	1.46	8	3	20	18
August.....	80	36	64.1	46.8	55.4	2.43	13	2	16	16
September.....	75	29	58.3	39.6	49.0	2.97	13	1	16	13
October.....	53	11	43.6	32.5	38.0	4.11	6	5	19	16
November.....	44	- 4	34.2	21.6	27.9	8.71	7	5	18	16
December.....	25	-36	4.0	-12.3	- 4.2	2.03	20	.....	11	5

AGRICULTURAL EXPERIMENT STATION, KODIAK. Latitude 57° 48', longitude 152° 22'. Hiram E. Pratt, observer.

1917.										
January.....	40	- 9	30.8	20.2	25.5	4.29	11	2	18	13
February.....	48	15	37.7	28.9	33.3	7.60	9	.....	19	14
March.....	42	12	35.2	27.0	31.1	4.75	9	1	21	14
April.....	56	24	42.2	31.8	37.0	3.77	5	16	9	20
May.....	58	31	47.7	36.0	41.8	5.51	6	13	12	18
June.....	71	36	57.3	43.0	50.2	2.86	5	17	8	11
July.....	72	40	61.0	46.7	53.8	2.88	1	24	6	15
August.....	65	43	56.2	46.6	51.4	9.95	.....	12	19	22
September.....	60	33	53.0	39.7	46.4	3.11	.....	22	8	12
October.....	53	7	45.5	34.4	40.0	6.41	1	23	7	19
November.....	40	- 3	30.9	18.2	24.6	2.65	4	19	7	15
December.....	40	6	31.4	21.1	26.2	4.32	1	20	10	12

¹ Record for 1 day missing.

Condensed meteorological reports—Continued.

LATOUCHE. Latitude 60° 3', longitude 147° 55'. J. A. Martin, observer.

Month.	Temperature.					Total pre- cipitation.	Number of days—			
	Maximum.	Minimum.	Mean maximum.	Mean minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1917.	° F.	° F.	° F.	° F.	° F.	Inches.				
March.....	48	13	36.6	27.6	32.1	14.92	11	2	18	21
April.....	55	23	44.3	31.2	37.8	6.91	17	.....	13	15
May.....	60	27	47.7	36.4	42.0	10.18	10	2	19	19
June.....	63	36	52.8	42.1	47.4	4.39	10	7	13	11
July.....	72	40	55.9	47.1	51.5	7.40	6	3	22	19
August.....	67	43	57.0	49.9	53.4	14.96	5	3	23	22
September.....	59	38	51.9	43.9	47.9	19.81	5	9	16	21
October.....	59	23	45.6	36.7	41.2	14.54	5	8	18	22
November.....	45	20	35.2	28.8	32.0	8.15	6	2	22	22
December.....	36	13	27.6	22.8	25.2	2.24	18	3	10	8

AGRICULTURAL EXPERIMENT STATION, MATANUSKA. Latitude 61° 30', longitude 149° 15'. F. E. Rader, observer.

1917.										
July.....	77	38	63.5	47.1	55.3	3.91	6	8	17	19
August.....	76	34	66.2	46.9	56.6	.67	10	3	18	6
September.....	64	24	52.8	37.8	45.3	2.12	6	5	18	10
October.....	57	— 2	40.4	24.7	32.6	1.69	6	11	14	8
November.....	43	—13	22.0	5.7	13.8	.55	6	8	16	3
December.....	27	—34	2.5	—13.8	—5.6	.12	25	2	4	1

NENANA. Latitude 64° 3', longitude 149° 7'. J. F. Kerber, observer.

1917.										
January.....	.....	—52	.....	—27.6	.....	.....	.....	.....	.....	.....
February.....	.....	—28	.....	7.3	.....	0.56	20	2	6	3
March.....	46	—26	24.6	7.3	16.0	.....	16	3	12	.....
April.....	58	—11	42.2	17.5	29.8	.50	19	10	1	1
May.....	75	18	55.0	35.6	45.3	T.	14	16	1	.....
June.....	76	36	66.4	46.4	56.4	.....	10	12	8	.....
July.....	78	41	64.1	48.4	56.2	5.57	4	11	16	23
August.....	79	41	68.5	49.0	58.8	1.96	12	2	17	7
September.....	76	21	54.2	35.7	45.0	.43	9	5	16	6
November.....	6	—49	— 3.2	—17.7	—10.4	.....	3	8	19	.....
December.....	— 2	—53	—22.5	—38.3	—30.4	.10	11	10	10	1

NOME. Latitude 64° 30', longitude 165° 24'. Mrs. Bertha Gantham, observer.

1917.										
January.....	32	—40	— 2.6	—19.5	—11.0	.....	20	6	5	.....
February.....	40	—26	25	11.8	18.4	0.14	.....	.....	.....	7
March.....	36	—27	23.9	6.9	15.4	.38	8	5	18	10
April.....	44	—12	28.0	11.2	19.6	.02	18	6	6	1
May.....	58	4	43.0	27.2	35.1	.25	6	10	15	11
June.....	65	31	50.5	39.3	44.9	4.41	5	8	17	18
July.....	79	34	56.7	43.6	50.2	1.48	.....	.....	.....	12
August.....	70	37	56.5	46.8	51.6	4.01	4	8	19	19
September.....	57	24	46.5	35.4	41.0	2.45	5	8	17	6
October.....	46	3	32.6	25.1	28.8	1.09	7	10	14	9
November.....	18	—18	9.0	— 3.3	2.8	.17	19	2	9	5
December.....	25	—22	7.9	— 3.7	2.1	T.	26	3	2	.....

Condensed meteorological reports—Continued.

AGRICULTURAL EXPERIMENT STATION, RAMPART. Latitude 65° 30', longitude 150° 15'
G. W. Gasser, observer.

Month.	Temperature.					Total pre- cipitation.	Number of days—			
	Maxi- mum.	Mini- mum.	Mean maxi- mum.	Mean mini- mum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1917.	° F.	° F.	° F.	° F.	° F.	Inches.				
January.....	25	-66	-22.0	-39.4	-30.7	1.09	16	4	11	7
February.....	29	-51	8.5	-13.6	-11.0	.50	11	4	13	4
March.....	40	-33	23.5	- 3.6	10.0	.06	9	8	14	1
April.....	75	-19	46.0	10.3	28.2	.06	18	12	.....	1
May.....	86	10	59.2	30.4	44.8	.04	18	9	4	2
June.....	86	36	73.1	44.7	58.9	.94	10	10	10	8
July.....	84	39	71.7	46.6	59.2	3.32	7	5	19	21
August.....	87	.....	71.2	.....	.....	.58	9	14	8	7
September.....	84	.....	54.5	.....	.....	1.93	2	21	7	10
October.....	55	.....	27.8	.....	.....	.89	4	4	23	9
November.....	14	-57	- 6.0	-21.6	-13.8	.68	6	8	16	6
December.....	-15	-53	-28.2	-40.1	-34.2	.....	30	1	.....	.....

SEWARD. Latitude 60° 6', longitude 149° 27'. J. O. Patton, observer.

1917.										
January.....	40	- 7	26.0	12.0	19.0	.....	.....	.....	.....	.....
February.....	44	-14	35.2	21.0	28.1	.....	.....	.....	.....	.....
March.....	43	10	37.8	26.7	32.2	.....	.....	.....	.....	.....
April.....	61	22	48.1	31.0	39.6	.88	16	1	13	8
May.....	71	22	50.8	36.8	43.8	2.02	8	3	20	16
June.....	78	34	58.3	44.5	51.4	1.45	15	4	11	9
July.....	79	41	61.4	47.2	54.3	3.94	9	8	14	15
August.....	69	41	59.7	47.7	53.7	5.87	6	4	21	16
September.....	67	32	53.8	39.6	46.7	18.35	10	7	13	17
October.....	58	12	45.0	32.1	38.6	.....	11	4	16	.....
November.....	42	5	30.4	19.7	25.0	4.97	10	2	18	.....
December.....	34	-11	16.3	6.0	11.2	.....	24	1	6	.....

ST. PAUL ISLAND. Latitude 57° 10', longitude 170° 16' 22". Operator in charge, naval radio station, observer.

1917.										
January.....	37	-12	18.7	3.9	11.3	3.45	.....	.....	.....	15
February.....	44	-10	32.3	14.4	23.4	1.82	.....	.....	.....	14
March.....	39	- 7	33.2	14.2	23.7	1.85	.....	.....	.....	10
April.....	42	4	34.6	14.9	24.8	.90	.....	.....	.....	4
May.....	45	18	40.5	27.5	34.0	1.80	.....	.....	.....	6
June.....	49	30	45.1	36.1	40.6	.71	.....	.....	.....	3
July.....	51	36	47.8	39.4	43.6	2.88	.....	.....	.....	8
August.....	54	39	48.5	41.7	45.1	4.24	.....	2	29	17
September.....	51	31	46.7	39.8	43.2	2.77	.....	.....	.....	13
October.....	46	23	42.1	34.1	38.1	3.53	.....	15	16	12
November.....	36	15	28.6	21.6	25.1	1.10	.....	.....	.....	6
December.....	37	13	30.6	23.4	27.0	2.13	.....	.....	.....	8

SITKA. Latitude 57° 3', longitude 135° 20'. C. C. Georgeson, observer.

1917.										
January.....	46	-1	34.9	23.7	29.3	8.65	5	5	21	20
February.....	53	-4	40.2	25.4	32.8	3.78	10	4	14	13
March.....	52	19	42.5	29.3	35.9	4.00	6	7	18	14
April.....	68	27	50.7	33.5	42.1	.88	10	10	10	8
May.....	62	30	53.9	38.4	46.2	3.03	4	8	19	15
June.....	74	37	56.0	43.9	50.0	3.54	4	6	20	15
July.....	69	41	59.8	46.8	53.3	6.02	3	5	23	23
August.....	69	41	61.4	49.6	55.5	8.08	6	6	19	19
September.....	70	40	58.8	44.9	51.8	10.00	8	8	14	18
October.....	60	29	49.0	38.9	44.0	20.73	1	8	22	31
November.....	56	18	46.3	35.0	40.6	14.81	2	4	24	26
December.....	50	4	33.3	22.2	27.8	9.78	5	.....	26	20

Condensed meteorological reports—Continued.

SULZER. Latitude 55° 16', longitude 132° 42'. Vivian V. Walters, observer.

Month.	Temperature.					Total pre- cipita- tion.	Number of days—			
	Maxi- mum.	Mini- mum.	Mean maxi- mum.	Mean mini- mum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1917.	° F.	° F.	° F.	° F.	° F.	Inches.				
January.....	44	-3	32.9	24.2	28.6	10.84	8	8	15	19
February.....	47	3	36.5	25.0	30.8	6.15	8	13	7	19
March.....	48	20	42.4	29.1	35.8	9.70	8	13	10	23
April.....	68	27	52.5	32.7	42.6	4.48	15	7	8	14
May.....	74	28	61.3	37.7	49.5	3.70	15	9	7	12
June.....	87	38	64.0	45.9	55.0	4.94	10	6	14	15
July.....	77	42	63.5	47.0	55.2	5.19	8	6	17	23
August.....	76	43	65.7	50.0	57.8	11.82	9	4	18	21
September.....	77	36	64.5	45.2	54.8	18.32	11	4	15	20
October.....	62	29	50.0	40.6	45.3	23.36	4	5	22	29
November.....	58	25	47.6	38.1	42.8	42.92	1	10	19	28
December.....	44	2	33.3	22.8	28.0	13.80	7	11	13	24

TANANA. Latitude 65° 13', longitude 152° 2'. Effie E. Stalze, observer.

1917.										
January.....	34	-62	-20.4	-40.3	-30.4	0.93	21	4	6	6
February.....	28	-40	10.1	-7.8	1.2	1.85	13	3	12	7
March.....	38	-36	20.9	-3.3	8.8	.16	10	8	13	7
April.....	60	-16	42.1	11.3	26.7	.03	15	11	4	2
May.....	82	10	56.3	30.2	43.2	.21	14	10	7	3
June.....	81	31	68.1	44.3	56.2	1.19	4	12	14	13
July.....	85	32	66.8	45.6	56.2	5.18	3	6	22	21
August.....	79	33	68.4	44.5	56.4	1.06	6	10	15	7
September.....	72	20	50.3	35.5	42.9	1.96	5	4	21	15
October.....	48	-13	27.7	16.5	22.1	.39	6	8	17	10
November.....	13	-51	-10.6	-22.7	-16.6	.41	16	8	6	6
December.....	-9	-52	-24.5	-35.3	-29.9	.01	26	5	.....	1

VALDEZ. Latitude 61° 7', longitude 146° 16'. Myrtle F. Bilhings, observer.

1917.										
January.....	34	-20	22.3	10.1	16.2	5.27	.....	.....	.....	17
February.....	45	-24	29.4	9.4	19.4	3.49	16	6	6	10
March.....	40	3	33.9	17.7	25.8	1.56	10	8	13	9
April.....	58	7	45.2	23.5	34.4	.41	21	4	5	4
May.....	61	28	50.6	35.6	43.1	1.32	11	2	18	13
June.....	73	36	56.6	43.3	50.0	1.24	6	9	15	14
July.....	72	37	56.2	44.2	50.2	4.54	4	6	21	21
August.....	64	35	57.5	43.9	50.7	2.15	9	7	15	19
September.....	59	29	49.3	37.3	43.3	10.28	7	2	21	24
October.....	53	20	40.8	29.3	35.0	6.23	11	5	15	15
November.....	35	5	29.2	16.6	22.9	4.58	8	5	17	19
December.....	30	-15	13.2	1.9	7.6	.14	20	4	7	2